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SCIENCE AND TECHNOLOGY POLICY

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SPECIAL LEGISLATION NEEDED TO PROTECT, CONTROL S&T RESEARCH ACTIVITY

Moscow PRAVDA in Russian 23 Dec 81 p 3

[Article by V. Dozortsev, doctor of juridical sciences and professor: "The Law and Scientific-Technical Progress"]

[Text] The significance of scientific-technical progress for the future development of society is undeniable. The decisions of the 26th CPSU Congress regarded it as one of the most important means for accomplishing the main task of the 11th Five-Year Plan, the ensuring of progressive economic development. It is necessary to utilize, with maximum completeness and effectiveness, all means for accelerating scientific-technical progress, including one of the most effective -- law.

Legislation fulfills and organizational function in all spheres of management in society. But in the sphere of scientific-technical progress, its role is especially great, and it is steadily growing. This phenomenon has already declared itself as a result of the industrial revolution. For example, patent law established a monopoly over the application of scientific-technical achievements. This has allowed the recovery of expenses for the assimilation of innovations and the receipt of a corresponding standard of profit for invested capital.

Patent law has now already become insufficient. To achieve the final result, a complex of interrelated measures is needed -- economic, organizational, and technical -- which are varied at each stage of the science-production cycle, but which form a unified system. A special concept arose, for the designation of which the term "innovation" began to be used. In implementing this complex of measures, an important role belongs to the state, since individual enterprises and even whole economic sectors are not always in a position to undertake all expenses and often have to utilize the resources of society as a whole. A branch of legislation has come about that can be referred to as innovation law.

The Soviet state, from its first days, has had to be involved with the organization of scientific-technical progress. Initially, regulation was not established completely, but just for the most important sectors. But already this meant that our country had become a pioneer in creating innovation law; the emergence of a new branch of legislation became one of the prerequisites for accomplishing the task that, in our day, is formulated as the need to unite the achievements of the scientific-technical revolution with the advantages of the socialist system of management. Only socialism permits the establishment of procedures for utilizing

these achievements, the "legal conditions," which reflect their direct social essence: they can be utilized simultaneously by an unlimited number of enterprises.

For the intensive conduct of research and development and for putting their fruits to the service of the economy, it is necessary to direct the means received in material production to the sphere of intellectual activity. Here, also, procedures are needed to be established by law. Legislation also helps solve a number of more private problems -- the conditions for accomplishing financing, the mechanism for fixing prices on new items, and so forth.

The scientific-technical revolution has drawn hundreds of thousands and millions of people into research and development. And very rapidly there appeared the need for legislative regulation of this sphere of activity, and various uncoordinated acts needed to be replaced by a system. This is a whole stage of development in legislation, the establishment of which began in the first half of the 1960's.

It is natural that the first step was to utilize the mechanism already developed for another sphere of production -- the material sphere. A general procedure for planning was diffused throughout research, development, and introduction into production; scientific and technical organizations were transferred to cost accounting; contractual relations were conducted with users; and property responsibility was established. This was an important step in the development of legislation.

But it was often accompanied in the first stage by a mechanical transfer of the rules adopted in the sphere of material production to the sphere of intellectual labor. This has been unjustified and has involved negative consequences. It is necessary to take the specifics of the intellectual sphere more fully into account, since their own peculiarities make their own demands on the content of legal standards.

Let us take, for example, state management of research and development. This is not only management on the part of upper-level bodies. Science does not recognize agency boundaries and, here, informal management plays an important role. Therefore, along with traditional management, such forms of management as coordination have arisen. But the substance of laws and obligations of coordination are not precisely defined, and the respective legal standards have not acquired accuracy.

The approach to planning scientific-technical work has also been specified. Undoubtedly, this is built on general socialist principles. But the means for implementation have to be selected in accord with the character of the scientific-technical sphere. For example, the system for planning the "dovetailing" of stages in the science-production cycle must not be too strict. It is not possible always to prepare the results of still unfinished work for introduction into production: the lack of creative success cannot be discounted. But even in case of complete success, it is not known beforehand what the sought-for technical solution will be, and that is why complete preparation of the next stage is difficult. This means that very clear, but rather flexible forms of matching various stages in the research-development-introduction cycle are needed.

The effect of the Statute on Socialist Enterprise has been spread to scientific collectives. This statute was meant for organizations operating under cost account-

ing, but is in force for all scientific-research units -- both those operating under cost accounting and those operating under the budget. And the cost accounting of organizations operating in the intellectual sphere differs from cost accounting in material production. Another example is from the field of contractual relations of institutes and enterprises. The objects of technology being created often have no analogs in the past and, in making contracts, it is hardly possible to establish a firm price as in the manufacture of series products. In planning the work of institutes, it is necessary to leave reserves for exploratory subject matter related also to the personal creative interests of scientists. For fuller utilization of the scientific potential of VUZ's, the legal regulation of their activity must be distinguished in many respects from scientific-research and planning-design organizations.

The task of improving innovation law poses yet another problem. Legal instrumentation for the intellectual labor sphere is just now being created. For the present, it possesses a rather poor arsenal of means, which do not respond in all respects to many kinds of society's needs. This backwardness must be overcome quickly. It must assist close cooperation between science and practice. As noted at the 26th CPSU Congress, the laws must be subtle and more precisely regulate various aspects of social relations.

This problem appears most clearly with respect to the organization of practical utilization of scientific-technical achievements. The decisive, most urgent sector today is the introduction of discoveries and inventions, and the party has posed the task that scientific-research and planning-design work must be brought into closer relationship with production -- economically and organizationally. In the regulation of procedures for introduction, much of the effort up to now has been directed at creating a unified scheme. But relationships in management are complicated and take many forms. It seems that the chief way to overcome the difficulties is the recognition and creation of a legal mechanism for typical situations. In some instances, it is necessary that developers personally participate in introduction and, in other instances, that a scientific-research institute have a special section for introduction; in some places, "introduction" organizations are needed and, in other places, introduction can best be accomplished through scientific-production associations; or it is useful to subordinate part of a scientific-research institute to production enterprises, but to give some institutes "their own" experimental plant, and so forth. The more carefully substantiated is the set of typical schemes, the more fully will the potential of science be utilized. In other words, there is a need for flexible and diverse legal means that promote the integration of science and production.

The need is arising for new organizations and a variety of forms for contracts and centralized management schemes. A differentiated approach is especially necessary in the organization and legal support of special-purpose complex programs. Urgent also is the task of developing legal means that have no counterparts in the past. Legal work is particularly awaited on the question of criteria for determining whether manufactured items correspond (or do not correspond) to the best domestic or world level. The "new technology" category, unknown in earlier practice, has appeared, and there must be a clear formulation as to who and by what criteria innovations should be included under it.

The process of forming a new field of legislation is not only creating individual standards and legal categories. It also means bringing out the internal relations among them and being concerned with their interactions. In many cases, normative acts are not coordinated; they duplicate one another; they sometimes even contradict one another; and there are also gaps between them. The time has come for creating an internally unified, whole system of legislation, with agreement among its parts, which responds to the requirements of the scientific-technical revolution. Today's isolation of its individual parts (for example, invention law and legal acts on standardization) express agency tendencies and to a large degree retards scientific-technical progress.

The development of a unified normative act covering the whole field of innovation law will establish correlation and interaction among its various parts -- this is not only the best, but also the only possible way today to build an internally consistent field of legislation. In my view, the promulgation of such an integrated act is something that cannot be put off.

Of course, it does not at all exclude acts pertaining to private questions. On the contrary, it will give them clearer direction. But first, a complex act should be promulgated and only after that should work be started on the improvement of documents pertaining to the more private questions. Thus, a proposal is now being put forward for the development of a legislative act on science. In my view, it covers only part of the problem -- project planning and design work; the introduction stage will be laid aside. The same applies to legislation on invention, standardization, and scientific-technical information.

This does not at all mean that efforts can be weakened on improving individual elements of legislation on scientific-technical progress. On the contrary, in the existing acts, for example the Statute on Discoveries, Inventions, and Rationalizers' Proposals, there need to be changes and additions, the necessity for which has been prompted by life. But if we are speaking of conceptually new acts, the priority ought to be given to the more general among them.

It seems that a generalizing act on the organization of scientific-technical progress must have the rank of law. Its promulgation, of course, must precede the development and testing, over a period of several years, of new standards and systems for their interaction. But, taking this into consideration, it would be useful not to put it off, but to provide for its preparation a list of acts subject to development and inclusion in the USSR Legal Code.

FINANCING SYSTEM DISCOURAGES LONG-TERM RESEARCH PROJECTS

Moscow PRAVDA in Russian 1 Dec 81 p 3

[Article by G. Lastovkin, general director of the "Lenneftekhim" scientific-production association and a candidate of engineering sciences, and I. Sadchikov, section chief and a candidate of economic sciences: "The Rewards for Petty Topics"]

[Text] This question -- the introduction of development results into production -- has become a painful topic. It sometimes happens that you meet a colleague from a related institute, you have a conversation about the latest happenings, and his eyes light up: there are so many interesting things that promise great economic effect. But you ask about introduction into production, and his eyes lose their lustre.

Science has the right today to be considered the first phase of the production process; its results are the most important source of rising labor productivity and for accelerating scientific-technical progress. For example, in the past year, three-fourths of the increase in industrial profit was produced by introducing new engineering and technology.

Particularly right now, when the task of putting the economy on the path of intensification has reached full stature, it is not possible to reconcile oneself to obstacles that stand in the way of movement toward this goal. The value of success on this path (and lack of success, also) is constantly growing. We do not have the right to orient ourselves toward the minimum. The task is to work for the optimum alternative. It is not simply a matter of developing new technological processes, but of developing those that provide for the intensification of existing and projected production plants.

Most of all, this is hindered by the defects of management, which is imbued with the habit of taking the easy way and the one that requires least expense and effort.

The introduction of new technology is still a long and difficult procedure. Let us refer to our own experience. Let us take, as an example, oxosynthesis -- a basic petrochemical process. With the help of this process, alcohols, acids, and aldehydes are produced from the products of petroleum and gas processing. In the past year, using the new oxosynthesis technology, the manufacturing capability was set up for an intermediate product for the preparation of plasticizers. And almost simultaneously, production of butyl alcohol was put into operation. From the beginning of the implementation of the idea to the output of real items, it took

10 years. The delays in introducing the technology into production took no less than two years. With other innovations, it is even worse. Thus, the oxosynthesis process for catalyst improvement developed six years ago according to a task set by the USSR State Committee for Science and Technology, has still not been introduced, and in bringing into realization the process for producing the various acids, we have already struggled for ten years, but still the end of the delay is not in sight. In the meantime, it is interesting and highly effective.

Such neglect is well known, and the party, at the 25th Congress, clearly formulated the requirement to put an end to delay in assimilating the results of long-range developments. This goal is also the object of the transfer of all economic sectors and their scientific-technical organizations to the cost-accounting system for organizing work in the creation, assimilation, and introduction of new technology on the basis of commission-orders (contracts). Such transfer is provided for in the decree of the CPSU Central Committee and the USSR Council of Ministers on improving the economic mechanism. The high degree of effectiveness of this system for managing scientific-technical progress has been demonstrated by the experience of the electrical equipment industry over a number of years. For over five years, enterprises of the power machinery-building, chemical, and certain other sectors have structured their work in such a manner. Among these is our "Lenneftekhim" scientific-production association. The results provide a basis for stating that this system orients institutes and factories toward the introduction of up-to-date equipment and interests creators of technology in increasing its quality and effectiveness. At the same time, unsolved problems have appeared, and this has induced us to take up the pen.

Most of all, there is worry and concern about the urge on the part of many collectives to give first priority to simple tasks, but the larger ones that provide the most effect are put off "for later." So what causes this orientation toward petty developments?

One of the reasons appears to be the following. Rewards for creating technology have been made dependent on the results of their introduction into the economy. Petty improvements move ahead, naturally, much more easily. At a small enterprise, also, expenditures are not very large, anyway. But what if it is a large complex or a whole sector? Here, what happens is that the fruits of research on large-scale projects in that same chemical industry are realized no sooner than in five to six years. And the developers of such projects remain without economic incentive funds, although they have shown initiative and have fulfilled state tasks.

We can raise the objection that incentive funds are being advanced for such projects. True, but the amount of the advance does not exceed 30 percent of the total amount of the award for creating new technology. So, it appears that undertaking the creation of progressive technology is often unprofitable.

It appears that the elimination of the tendency toward petty subject matter would be helped by being included in the realm of economic incentive for scientific-research work by those bodies that are responsible for planning and introducing new technology into production -- we have ministries and agencies in mind, most of all. Why not include their main administrations among the codevelopers of new technology, appropriately forming economic incentive funds for them?

A factor of no little importance is changing the attitude toward the length of time it takes to create progressive engineering or technology as an indicator for the work of scientific organizations. It is usual to consider that, if a collective could reduce this time, it would be on the right path. Such a collective is recorded as being in the forefront. Meanwhile, if a research institute has spent two years on creating some innovation, and the next year has gone by before success is proclaimed, it is worth looking at what kind of technology has been created. In comparison, unfortunately, it often turns out that petty topics have been selected and improvements of little significance have been introduced into production.

In the planning of scientific-research work, the question of agreement with plans for capital construction comes with special force. The real way is through special-purpose complex programs. The special-purpose program approach to planning scientific-technical progress is an effective means for improving the quality and the success rate of research and design and for shortening the periods required for introducing the achievements of science into production. One of its virtues is that it takes into consideration the real capabilities of the interested parties, science and production.

Under the new management conditions, the self-financing of work on creating new technology is being applied more widely. For this, each economic sector has a unified fund for the development of science and technology. It is formed from deductions from the profit of enterprises and is spent for financing research and for the reimbursement of additional expenditures for assimilating innovations. Often, the lion's share of means from this fund is spent just on the reimbursement of expenses for assimilation to the detriment of expenditures for research. In principle, of course, it is possible to reduce financing for the development of science within an economic sector to the financing of just work on creating scientific backlog. The remainder is then used for contracts by producers. Enterprises, in turn, for these needs, can spend sums directed from that part of the unified fund that is designated for reimbursement for the assimilation of progressive technology. Such redistribution of means from the fund between the two areas of utilization permits a stronger relationship between science and production. But with this, institutes can still further avoid long-term subject matter.

The procedure that has evolved for deductions for the economic incentive fund of institutes is not entirely satisfactory. Now, the amount of the deductions included in the estimated cost of research goes under the heading of expenditures for research. But deductions transferred to institutes from enterprises in accord with the growth of profit from the introduction of new technology are not considered expenditures for scientific research. The division here is purely conventional. But it is not entirely harmless. Having arbitrarily excluded money coming into the economic incentive fund of an institute from the amount for financing scientific research, we create conditions for various manipulations. The most widespread custom is to search for a relative effect from the reduction of product cost at the factory when it really is manifested in the increase in profit due to improvement in the quality of manufactured items or in the reduction of expenses for construction or in lengthening the serviceability of equipment. But why make people look for "fake" effects instead of those really achieved?

The interrelations between scientific-research organizations and project-planning organizations are also complicated without need -- also relative to economic incen-

trouble. The trouble is that the project-planners are still outside the system being introduced for planning and for economic incentives for work in creating new engineering and technology. A paradox comes about: the research institutes are economically tied to enterprises, but the intermediate link -- the project-planning organizations -- are separated. As an example, "Lenneftekhim" conducted research on creating domestic reagents for the synthesis of intermediate products for the production of isoprene rubber. The design of a reagent and the preparation of the documentation were undertaken, naturally, but the project-planners. For the introduction of the innovation, we received a due among of allotment, as did the plant that made it, but the designers remained unrewarded.

This problem is especially acute in scientific-production associations, where scientists and project-planners are found under the same roof. This has been discussed from the instant that scientific-production associations were created, but no measures have been taken.

Cooperative efforts of various institutes and enterprises in developing large-scale scientific-technical problems are tied to the growing volume of efforts according to agreements for joint activities, to the exchange of technical documentation, and so forth. In some places, even coordination services have been created. Especially striking is the growing number of trips. Experience shows that superfluous travel can be fully avoided if managers of many enterprises change their attitude toward it. Now, it often happens that we refer to calculation of the effect on the factory, and we say go and get the data. We go and spend three days and, at the same time, also money. There is a lot of this: our specialists wheel off to Angarsk and Omsk, to Pavlodar and Salavat, and to Tol'yatti. But all this, our colleagues could send us by mail. Why not determine the responsibility of partners more precisely and strengthen it with appropriate regulations? Procedure would be improved, and hundreds of thousands of rubles would be spared.

The assimilation of the new system for managing scientific-technical progress assumes also its constant improvement. The experience accumulated by institutes and enterprises will help travel down the chosen path with greater returns and will help put the creation and assimilation of progressive engineering and technology on a planned basis.

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EFFECTIVENESS OF SCIENTIFIC-PRODUCTION ASSOCIATIONS EVALUATED

Minsk PROMYSHLENNOST' BELORUSSII in Russian No 10, Oct 81 pp 42-46

[Article by A. Morova, section chief at the Belorussian Scientific-Research Institute for Scientific-Technical Information and a candidate of economic sciences: "In the Position of a Stepdaughter: What Science Has Turned Out to Be in Some Scientific-Production Associations of the Republic"]

[Text] The scientific-production association . . . In recent years, preference has been given more and more to this promising form of science-production relations. And this is not accidental. The scientific-production association [NPO] represents a unified scientific-production and economic complex which comprises, as a rule, research institutes, planning-design and technological units, production-development organizations, and experimental and industrial enterprises. In some cases, NPO's have centers for training personnel for science service at enterprises and organizations of an economic sector that do standard research, patent, computing, and such types of work.

The basis for creating NPO's is the idea of the priority of scientific research and the increasing necessity to put science to the service of effective solution of urgent problems in industrial production. In this case, science with its rich possibilities must become a dominant command force, capable not only of providing for the needs of current production, but also of creating a backlog for the future, of going ahead of technical progress, and of being the guiding star for production. This is precisely the goal when a scientific-research organization is made the head organization within the framework of an NPO.

In distinction from production associations and scientific centers, NPO's must accomplish all stages of the "research-production" cycle: exploratory and applied research, planning-design and technological development, preparation and testing of experimental models or batches of new products and their submission to industrial units for serial assimilation, and the conduct of installation and production-development work. This approach to the implementation of a scientific development (usually this has been done by various organizations, but now is under "one roof") provides great advantages. It is sufficient to say that scientists sometimes spend more time by a factor of 6 or 7 on getting various agreements than they do directly on the preparation of a new model. According to calculations by sociologists, working time is only 10 percent of the total time taken for creating new technology in a majority of cases. The rest of the time is filled with weeks and months of

fruitless running around, forcing information and technical documents out of all kinds of departments, and making components and subassemblies. It is obvious, therefore, how the term "introduction of new technology" originated, since it designates, as a rule, pushing into a hostile environment.

Producers have also made gains from this union. They no longer have to go begging to science or use intermediaries to ask for aid from scientists. Thus, a new, organizationally presented and legally reinforced, form has been found for the relationship and integration of science and production.

Analysis of the activities of a number of NPO's permits speaking with confidence about prospects for their development. Most of all, they must be looked upon as a kind of proving ground for developing tomorrow's production elements and the organizational and economic pieces of highly developed scientific-production complexes that will determine the character of industry in the future.

Unfortunately, the process of creating NPO's in our republic is going unjustifiably slowly. This is especially notable when comparison is made with the Ukraine. There, about 30 NPO's are already operating in industrial sectors. The necessity for more active creation of NPO's in our republic received attention at the 19th and 20th plenums of the Belorussian Communist Party Central Committee and at the 29th Belorussian Communist Party Congress. The development of a network of NPO's as one of the first-priority tasks -- increasing the success-rate of scientific-technical investigation -- is defined also in the "Basic Directions for the Economic and Social Development of the USSR for 1981 to 1985 and for the Period to 1990."

But the creation of new NPO's is only one side of the problem. Another side consists of determining the degree of effectiveness of already existing ones, the more so because the trial period for many of them has long ago passed and it is possible today to make certain conclusions. What are these conclusions? First of all, I would like, with justification, to note certain positive aspects. Characteristic of a majority of our associations, as well as for all others, is the reduction of the time lag from the origin of an idea within the walls of a scientific-research institute to its practical embodiment in the form of new engineering, machines, equipment, and progressive technology. On the average, within the framework of republic NPO's, the path from science to production has been reduced to from 77 to 36 percent of its former length. Thus, at the "Dormash" NPO, which has functioned since 1975, the time spent for research, experimental design development, and assimilation of new products went down from 4.7 years to 2.7 years and, at the "Progress" NPO, from 2.5 years to 1.8 years, and so forth.

Such reduction in time from the beginning of a development to its introduction at these and other associations has been achieved largely through combining separate stages of the "research-production" cycle, through stage-by-stage control over fulfillment, and so forth. For example, at "Dormash," work proceeds in parallel or in sequence on the development of technical and work plans, testing and working up experimental models, and also final development and preparation for production.

The second important aspect of the functioning of NPO's is improvement in the quality of developments and the cancelation of topics that do not provide an economic effect. As a result, in a majority of republic associations, the propor-

tion of developments in which the technical level corresponds to the best domestic and foreign models, is 10 to 12 points higher than among scientific organizations of economic ministries and agencies. Many NPO's are introducing complex quality-control systems for products and developments.

The quantity of acquired patents and authors' certificates has grown along with this, and the economic effect from introducing innovations has increased. During the years of the 10th Five-Year Plan, just in the republic NPO for powder metallurgy by itself, 143 authors' certificates for inventions were received, and 10 of them were patented in a number of other countries. The economic effect from developments during this period was 23 million rubles, including 8 million rubles in 1980, the year that the NPO was created. Compare this with nine years ago, when there was not even talk about associations, and the Scientific-Research Institute for Powder Metallurgy provided the economy only 160,000 rubles in yearly savings.

Among the other merits of NPO's created within the republic, mention must be made of improvement in the utilization of funds directed toward scientific research, of improvement in the management structure through liquidating duplicated services, and of the creation of conditions for the broad use of computers, organizational technology, and transition to automated systems. A graphic example in this regard is the "Minskproyektmebel'" NPO, where an automated control system was designed and introduced for the wood-processing industry at the level of all-union production associations and republic ministries. The use of developments in the mechanization of production processes brought the association an economic effect during the past five-year plan of 400,000 rubles.

Of course, all these are indisputable plusses for republic NPO's. At the same time, in the organization of their work, in planning, in economic incentives, and in the evaluation of activities, there are a number of serious shortcomings. First of all is the imbalance among scientific, planning-design, and production components of the associations and disproportions in scientific and production activity. Thus, the scientific-technical potential at the "Dorstroytekhnika" NPO, the powder-metallurgy NPO, and several others still exceeds the capabilities of the constituent enterprises. At the same time, developments at the NPO for the production of potato products involved only 56.4 percent in 1980, and even less, 9.5 percent, in 1978, of the capacity of the Gantsevichi Experimental Canning and Vegetable Drying Combine.

Further. Many republic associations do not have the organizational units necessary for scientific-research and experimental-design work. Thus, there is no scientific section at the "Minskproyektmebel'" NPO, which utilizes the developments of analogous ministerial scientific-research institutes. There are no scientific-research units at the "Progress" NPO for means of mechanization and rigging of the BSSR Ministry of Local Industry or at the "Dormash" NPO, which implements exploratory research on the basis of contracts with other scientific organizations. In addition, the "Progress" NPO, up to the present time, has had no laboratory-experimental base. As a result, experimental projects relating to the manufacture of new models of goods for public consumption, technological rigging, testing, and working out of technological processes are conducted directly at enterprises, and this, naturally, upsets production rhythm, lowers product quality, and leads to interruption in planned tasks.

The absence of scientific-research units in a majority of NPO's in economic sectors of the republic and the lack of attention to them even where they exist can hardly be justified. As a rule, this all leads to sharp reduction of the scientific backlog and of the effectiveness of developments by the project planners, designers, and the technologists of the associations. The practice of leading NPO's around the country convincingly shows that the most capable associations are those where the head organization is a scientific-research institute.

At the same time, the method that has evolved for evaluating the work of NPO's, basically according to production indicators (gross product and profit), does not contribute to the priority of scientific-research activity over production activity. Moreover, it stimulates the priority development of production at the expense of scientific-research units and experimental-design units. It is not accidental, therefore, in republic NPO's, that the ratio between the number of workers of scientific, planning-design, and technological organizations and those in production and experimental enterprises and the ratio between expenditures for scientific and experimental-design work and production of gross product keeps shifting toward the latter indicators. It is just this circumstance that largely also explains the fact that association managers try to burden their experimental enterprises with the manufacture of serial products. This is aided also by the absence of standard bases for the development of experimental production and of procedures for calculating capabilities for it in planning the size of the NPO's gross output.

In particular, this pertains to "Dormash," "Progress," and certain other NPO's. In such a situation, production activity begins to supplant scientific-technical activity. The number of incomplete developments that have not undergone experimental testing grows, their quality declines, and the time required for their introduction is prolonged. In addition, collectives are distracted from the creation of models of new engineering and technology and their assimilation by other enterprises of the economic sector (or subsector) in charge of the NPO. With excessive output of series production, the basic advantage, the very sense of NPO's is lost -- to be responsible for scientific-technical policy within an economic sector, at the advanced frontiers of scientific-technical progress.

The next substantial organizational defect is the retention by component units of the association of legal independence, which is a violation of the "Policy on Scientific-Production Associations." Many of the organizational entities, primarily production entities, entering into NPO's, have independent accounting systems. In particular, this pertains to the Gantsevichi Experimental Combine and to the Mar'ina Gorka Mechanical Plant, which are parts of the NPO for potato product production, to the "Oryodorstroy" trust and the experimental plant of the "Dormash" NPO, and to others. Such decentralization turns the NPO, essentially, into a conglomeration of independent organizations which, in large measure, lowers effectiveness in the activities of NPO's. In addition, the retention of legal independence by organizational entities forming NPO's hampers the creation of a unified complex planning system (the most important advantage of an association) and hinders the proper formulation and distribution of incentive funds.

Actually, as analysis of planned work in republic NPO's shows, there is no unified, comprehensive system of planning in them. The ministries, instead of confirming the complex plan provided for by the "Policy on Scientific-Production Associations,"

give the association units poorly tied-together tasks for scientific and production activities, and they use the methods and indicators that are applied in planning the work of ordinary production associations. In a majority of cases, their plan consists of such sections as a subject and a labor plan, a cost and profit plan, and a plan for product production and sales. In addition, some indicators are established for a financial plan and for the formation of economic incentive funds. All this is the result from lack of standard methodological materials for planning in NPO's. Incidentally, the typical methodology for developing the yearly plan (the scientific-research and experimental-design work industrial-financial plan) for NPO's has already been created and was discussed at joint meetings of specialists from USSR Gosplan and the USSR State Committee for Science and Technology in November 1979 but, unfortunately, up to now has not been approved. However, to ascribe the mistakes in planning NPO activities solely to the lack of standard-methodological materials would be incorrect. In some NPO's of the country, for example, there is much experience in complex, unified, comprehensive planning for the work of association units within the framework of the science-production cycle. The effectiveness of such planning is confirmed, let us say, by the experience of the "Plastpolimer" NPO. After the introduction of complex planning here, the lengths of time for assimilating very complicated and labor-consuming technological processes were reduced up to 5 or 6 years, that is, to two-thirds to one-half of the earlier amounts. The capacity of these plants increased by a factor of from 2 to 5. The period for creating experimental and experimental-industrial equipment and assemblies was reduced to one-third to one-fifth of the former time, and the yearly quantity was brought up to 8 to 10 versus 2 to 3 earlier. It is completely natural that the experience of unified, complex planning could be advantageous for us also.

A typical shortcoming in the planned activity of many associations in the republic is also the insufficiently high qualitative level in the development of scientific-technical forecasts and programs for the most important problems of a sector or subsector, to say nothing about some NPO's ("Dormash" and the NPO for potato products, for example), where there is no forecasting at all.

Forecasting research, as a rule, is conducted from case to case, despite the fact that special units for it are mandatory within the framework of associations. Frequently, the effectiveness for forecasting the creation of new technical systems is reduced because it is not supported by constant forecasting information on times, expenses, utilization of resources, and the observance of parameters. Sections of scientific-technical information and patent services work without active output. Individual NPO's, such as "Minskproyektmebel", generally do not have patent sections. Also, long-term concepts for introducing scientific-technical achievements, capital investment, and the development of new manufactured items and technology are formulated without the necessary intercoordination. Their formulation does not take into consideration the prospects for development of closely related economic sectors. Concepts of the whole process of introduction constantly are being corrected during the course of implementation, its goals and tasks are being revised, and the due dates for implementation are being extended. It happens that individual parts of the plans are not fulfilled at all.

In many republic NPO's up to now there have not been calculations of economic effectiveness of the developments utilized. Data from primary accounting are

often not confirmed by records of introduction. This pertains, for example, to such associations as "Progress," "Minskproyektmebel," and some others.

Republic NPO's also poorly utilize promising possibilities for improving the quality of developments. The planning and comparison of the technical level of research with foreign and domestic achievements are accomplished, as a rule, only at the development stage of a technical task or project. Therefore, among the most important, large-scale scientific-technical achievements introduced into production during the 10th Five-Year Plan, only some NPO's name new types of products, technological processes, raw materials, materials, or equipment that correspond to world standards. Among economic-sector NPO's, only a few ("Dormash" and "Avtotranstekhnika") are leading developers in the country. It is not surprising also that NPO's cannot boast of a high proportion of products with the state Mark of Quality. On the average, the proportion of such products in total production among republic NPO's fluctuates from 10 to 15 percent, while in other large leading associations of the country it reaches 30 to 40 percent. And now, the qualitative level of introduced research and development, appearing as a basic fund-forming indicator, acquires special significance. An important measure for improving the quality of scientific-technical achievements is the preparation of technical-level charts and calculations of economic effect which are obligatory for each object included in a program. This to a large degree will reduce the flow of nonurgent research and development that do not provide radical improvement in the technical-economic parameters of new technology in production and in operation. However, the transition to a new system of planning in NPO's is being delayed without justification. Up to now, it has been ignored by such associations as the NPO for potato product production, "Dorstroytekhnika," and certain others.

Also undecided for republic NPO's remains the question relating to improvement of the system for economic incentive. Incentive funds for NPO subunits are formed individually, as a rule, without the right to redistribute them within the association. As a result, the managers of production collectives every quarter are awarded bonuses of 30 to 35 percent of official salaries, while managers of the head organization, who have both more worry and more responsibility, are awarded bonuses from the fund for material incentive for scientific units of up to 10 percent of salaries. In addition, tables of organization for institutes (scientific-research and planning-design) fail to provide for a number of position categories that are very important for the normal life of associations: chief technologist, chief economist, leading engineers, finance section chiefs, deputy chief engineer, and so forth.

The general operating policy for the formation and distribution of economic incentive funds and material incentive funds is still not worked out methodologically. It takes into account only the economic effect from new technology, which depends on the volume of introduction and the unit cost of new products. This approach is not justified for those associations where expenses are greater, but the cost of products is low (for example, the NPO for potato products production).

Similar "flaws" in economic incentives do not help keep qualified personnel at NPO's. That is why Belorussian associations have very few specialists with advanced degrees. Thus, in the "Dormash" NPO, a total of only 1.1 percent of the total number of workers have advanced degrees and, in the "Orgstankinprom," there is only one candidate of sciences.

Thus, the analysis of republic NPO activity indicates that they are far from using all opportunities to accelerate scientific-technical progress available in this organizational form. In our view, the following can be very important factors in increasing the effectiveness of their work:

- the institution of complex, comprehensive planning of all stages in the "research-production" cycle and improvement in the quality of forecasting research;
- stricter observance of the requirements of the policy on NPO's and improvement in standard-methodological materials;
- transfer of associations to the cost-accounting system for creating, assimilating, and introducing new technology on the basis of commission-orders;
- improvement in the organizational structure of NPO's; and
- the formation of economic incentive funds dependent on the actual effectiveness of association work.

In the meanwhile, unfortunately, not all republic associations have "become organically combined complexes of science and production," as stressed at the 29th Belorussian Communist Party Congress.

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BETTER INTERBRANCH COORDINATION, IMPROVED PERSONNEL MANAGEMENT NEEDED TO INTENSIFY
SCIENTIFIC DEVELOPMENT

Moscow PRAVDA in Russian 26 Nov 81 p 3

[Article by G. Lakhtin, doctor of economic sciences: "Scientific Potential: How
Can It Be Utilized?; Intensification: Substance and Ways and Means"]

[Text] The decisions of the 26th CPSU Congress determined the course for the intensive development of the economy. The party constantly strives toward the achievement of more products of better quality for the Soviet people. But this will not come by itself. Deep qualitative transformations of production are needed. Science alone can engender them. Intensification, above all, is scientific-technical progress. Hence, it follows that the requirement for scientific results is sharply growing. And what opportunities there are for science! Up to now, the growth in its output has been made possible by increasing the influx of resources. Now, the sphere of science and science services engages over four million persons. Already it is impossible for society to further increase the influx of people by the former rates. There remains only one thing to do -- science itself must go through a transition to the path of intensive development and make better use of its potentials.

In both science itself and in the application of its results, serious qualitative transformations are becoming more imminent. The accumulated potential, never so great before, must be better utilized; therefore, the transformations must relate above all to organizational forms. Although the scientists' capability is always with him, its realization depends upon whom he works with, who poses the tasks, who and how his work is evaluated and paid for, and upon many other things.

Science is growing not only qualitatively, but the complexity of the problems placed before it is growing even more rapidly. Many organizations, from many fields of science and technology are enlisted in the solution of these problems. Scientific-technical progress is becoming more and more dependent on relations between economic sectors. However, this comes into conflict with economic-sector jurisdictions over the lion's share of scientific potential. The basic mass of scientific-research institutes, design bureaus, and experimental shops are subordinated to the ministries, which approve the subject matter, conduct the financing,

and, in this connection, take their own agency interests into consideration first of all. A significant number of developments, especially large ones, which determine the real progress of science and technology, do not fall within the framework of an economic sector.

Not that their inter-sector character can be explained simply, because there are no bases for thinking that the problem can be dealt with simply by creating yet another science system -- an inter-sector system. In some cases, inter-sector execution of research and development is combined with sector utilization of the results. Thus, the creation of non-blast-furnace technology for producing steel requires the participation not only of metallurgists, but of machine builders and instrument makers, but the "harvest" is reaped by ferrous metallurgy. At other times, the reverse is the case, when the achievements by one sector go to the advantage of many. For example, the development of improved deposition of galvanic coverings can interest the enterprises of tens of ministries.

The first of these situations has engendered such an organizational tool as inter-sector programs. They permit cooperation and tying together all participants (regardless of agency subordination) into a unified mechanism set up to achieve established aims. In the "Basic Directions for the Economic and Social Development of the USSR for 1981 to 1985 and for the Period to 1990," among the measures that provide for the development of science and the acceleration of technical progress, the development and implementation of special-purpose scientific-technical programs are given first priority.

However, we will not forget that, in a socialist economy, it is the plan (and not the program) that is law. Everything that is included in a program should then go into the five-year and yearly plans and "compete" for resources with other tasks which have not been included in special-purpose programs but which also must be fulfilled. At this stage, the priority of a program can be easily lost if it is not supported by a sufficiently powerful sponsor. An inter-sector state body should assume this role.

Moreover, program control is tied to the dual subordination of scientific units. While participating in the fulfillment of an inter-sector program, a laboratory is unquestionably subordinate to its own permanent management (for example, the management of an institute) and, at the same time, more or less to a person or body that manages the program. Now, the head organization usually represents the interested sector, but its ability to influence participants from other agencies is very limited. In our view, the decisive step must be to raise the management of large programs from the level of an economic sector to the state level. It is necessary to have a body with sufficient authority above the economic sector.

To all appearances, the USSR State Committee for Science and Technology could become such a superbody. This body, because of its status and structure, is capable of being not only the comptroller (as it is now), but the organizer for achieving the goals of scientific-technical development. But if all or some ministerial institutes and design bureaus are transferred to this committee, would it not turn into some kind of non-specialized, superministry, burdened with the supply, personnel, construction, and other needs of an ill-matched mass of organizations under its wardship? Moreover, one cannot fail to take into account the

fact that 70 to 80 percent of developments are fulfilled and implemented within the framework of a single ministry which manages them in the best interests of the economic sector.

A way out is seen in so-called matrix management. The essence of this is the scheme for dual subordination: one line of management determines what to do and another, how and for whom. In this case, institutes remain in the charge of the economic sectors, but the utilization of a portion of its effort for fulfilling inter-sector projects is subordinate to a state committee. The vitality of such a scheme wholly depends on the skilful organizational division of functions between the two lines of management.

Another class of situations covers cases where research is conducted in one economic sector, but its fruits find application in many. But the achievements of the participants in such projects in ministerial institutes have difficulty in overcoming agency barriers, which leads to the reduction of possible effects. Organizations are needed that are free from agency blinders. Public necessity for such "inter-sector" science has forced its own path without preliminary permission. Confirmation of this are institutes of the academies of sciences, first of all, republic academies (one can refer to the example that has become a primer -- the Institute of Electrical Welding imeni Ye. O. Paton). Essentially, academy science now performs two public functions: along with theoretical research, it also conducts applied research, primarily multi-sector in purpose.

But with general resource limitations there arises a danger that one function will develop at the expense of another. Material incentives help develop applied areas that have a direct economic effect. Will theoretical, fundamental research, which is the foundation for all science, suffer? Evidently, measures are imminent that will lead to organizational demarcation of the two areas in academy science. The advisability of this is related to the idea that theoretical research needs different methods for financing, for enlisting and evaluating personnel, for incentives than does applied research. A distinction must be made especially clear as to the statement of objectives: in applied science, the objectives are posed by the economy, but in fundamental science, by the scientists themselves.

In order to provide more results from the former numbers of personnel, it must also correspond to its purpose. Consequently, selection is needed, and so that there can be a selection, the supply should exceed the demand. This is the way it was earlier. Twenty to twenty-five years ago, science held first place in the economy as to salaries. Combined with the prestige of scientists' work, this brought young people into their ranks. Since then, scientific work has become a mass occupation and, in average salaries it lags such spheres as construction, industry, and transportation. Is this not one of the reasons for the fluctuations of personnel at scientific institutions and for the reduction in the flow of young people into technical VUZ's? Especially suffering are the specialties that pertain to the middle of the science-production chain -- the project planners and designers.

To bring about a change, the influx of fresh forces must be reestablished. But under the conditions of intensive development, this can be done only by freeing positions for the new arrivals. Strict selection is needed for existing personnel. Legislation should allow institute administrations to free workers with the phrase

"discharged in connection with completion of topic." On the other hand, it is time to think about how to reestablish the primacy of science in salaries. Since the allotment of additional money for this purpose is hardly possible, there remains another way -- one that is rather "hard boiled." A reduction in the number engaged in science and science services would allow their salaries to move ahead while maintaining today's funding. Simultaneously, another purpose would be achieved -- the release from nonproductive areas of workers whose departure would be no loss for science.

To produce scientific results means little unless they become part of the economy. Real intensification will not be achieved until the utilization of scientific-technical achievements is universal. The problem of introducing new technology stands as before in all its complexity. Individual measures such as increasing the size of prizes for new technology will not do very much. The mechanisms for managing scientific-technical development needs to be changed.

It is now oriented toward the formulation of measures for scientific-technical development, but not toward what is being achieved as a result. Let us assume that it is intended to introduce some technological process that promises to lower the cost of products. The fact of introduction is controlled and certified, but not its effect on production. However, it can be approached another way: by planning for a new level of cost, achieved by means of scientific-technical progress. This would force enterprise managers to seek innovations because there would be no other way to fulfill the task. Society does not need measures, but their results. And to manage scientific-technical progress, it seems, we need an "output" indicator that would measure the progress achieved and the deviations from the tasked level.

What kind of indicator is needed for this? Planning and accounting for the effectiveness of scientific-technical measures are now being introduced. At the same time, the necessity for raising the level of manufactured products is becoming more and more urgent. These measurements -- effect and level -- pertain to various aspects of the progress that is taking place. Effect characterizes the process of improving production from one stage to another. The level is the status achieved, that is, the results. The correlation of these two indicators can be explained by a humorous example. Let us assume that an untrained man is able to lift a 30-kilogram weight, but if he trains, he can lift a 50-kilogram weight. His effect, that is, the jump from the previous level, is 20 kilograms. The world champion in this weight category has lifted 200 kilograms, 5 kilograms better than the past world record. For him, the effect is only one-fourth that of the first man, but the second man is invited to the pedestal of honor -- for an achieved level. Thus, a high economic effect can be achieved going from poor to average technology. However, under the conditions of intensive development, the qualitative aspect is first and foremost, and is characterized by the level achieved.

At the 26th CPSU Congress, Comrade L. I. Brezhnev stated directly and unequivocally: "On a par with the best world and domestic models -- we cannot and should not accept anything less." A steady rise in the effectiveness of research and development and a growth in the level of the engineering and technology being created with the same or less expenditure -- this also will signify intensification in science.

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INTERDISCIPLINARY CONTACTS, ORGANIZATIONS NEEDED TO FURTHER S&T POTENTIAL

Moscow PRAVDA in Russian 11 Dec 81 pp 2-3

[Article by Academician B. Kedrov and P. Smirnov and B. Yudin, candidates of philosophical sciences: "Concerning the Interrelationships of the Sciences"]

[Text] The larger and the more complicated become the problems arising before society, the more important becomes the scientific approach to their solution. Socialism is vitally interested in science, seeing it as a powerful means for achieving its aims. Being guided by the teachings of V. I. Lenin, the Communist Party and our state are creating the most favorably possible social-economic and other conditions for its development and are conducting a consistent course for the union between advanced science and the practice of building a new society. The party has worked out an up-to-date formula for this union: to unite organically the achievements of the scientific-technical revolution and the advantages of socialism.

The accomplishment of this historic task requires, as was noted at the 26th CPSU Congress, the strengthening of interaction among the social, natural, and engineering sciences and the increase in their effectiveness in accomplishing the tasks of building communism.

1.

The most significantly deep trends in the development of science always are determined, in the final analysis, by social-historical practice, the level of its development, and its needs. This also pertains fully to such a trend as the establishment and strengthening of increasingly new interrelationships among the three leading groups of sciences -- social, natural, and engineering. These interrelationships are engendered and mediated by practice and by the necessity to concentrate the scientific potential created in our country on the accomplishment of urgent tasks in the building of communism.

Increasing the socially significant effect of scientific research under the conditions of developed socialism represents one of the chief reserves for the future advance of the economy on the road to its intensification and for the improvement of other spheres of social life.

This is also important for other considerations. As is known, expenditures for science and technology are enormous. Just in 1981, they are 22.6 billion rubles,

6 percent more than in the previous year. This is higher than the growth rate of national income. And, naturally, society is justified in expecting an equivalently high return.

The 26th CPSU Congress gave the character of a party directive to the resolution of the November (1979) plenum of the CPSU Central Committee for the development of the special-purpose program method as decisive in the planned conduct of the economy. For the 11th Five-Year Plan, the USSR State Committee for Science and Technology, USSR Gosplan, and the USSR Academy of Sciences developed about 160 scientific-technical programs, including 40 special-purpose complex programs that provide for large-scale implementation in the economy of the most significant achievements of scientists.

The wide application of this method opens up new opportunities for strengthening relationships among science, technology, and production and for producing the required social-economic and scientific-technical effect. Special-purpose complex programs are called upon to become a new effective form for utilizing the powerful scientific potential that we have.

But a complex program can only be really complex if it receives thorough substantiation. It is here that a broad field is opened up for cooperation among the representatives of the social, natural, and engineering sciences. In the course of such substantiation, along with the assessment of prospects for and effectiveness of the technical-economic solutions provided for in the program, questions should be examined with respect to optimum organization of program management, the rational utilization of resources and environmental protection, the social effect of program implementation, and so forth.

In the simpler cases, the substantiation can take place in the form of expertise by competent specialists on the appropriate aspects of the program, and this will allow determination of bottlenecks, the uncovering of existing reserves, and also identification of the scientific-technical problems that must be solved for successful program implementation.

In the more complicated cases, the framework of a program requires provision for the creation of special interdisciplinary subunits for thorough evaluation of the various alternatives for implementing the program and for operational study and solution of scientific-technical and scientific-organizational problems that arise during the course of implementing the program. It seems that the scientific council of the USSR Academy of Sciences on problems of the Baykal-Amur Mainline, the experience of whose work deserves very careful analysis, could be looked upon here as a prototype. We would like to hope that the USSR State Committee for Science and Technology and the USSR Academy of Sciences will be able to undertake the study and solution of these problems; on this depends the better utilization of the scientific potential that exists in the country.

2.

Broad-scale applications of the special-purpose-program method has been shown to be one of the most important methods and one of the new forms evolving today for relations between science and practice.

Until recently, the basic type of interaction between science and practice has been the introduction into industry, agriculture, or other spheres of practice of some kinds of already achieved results of scientific investigation. In this case, the whole cycle from a fundamental idea to its practical embodiment turns out to be primarily one-directional. As a result, that which is developed and introduced is not what the user needs, but what is more convenient or simpler for those who create the new technology.

This makes the optimum utilization of the achievements of scientific-technical progress substantially more difficult. In the course of the practical implementation of an idea, and sometimes even before this, unforeseen effects -- and often undesired effects -- begin to appear. These are greater, as a rule, the more that what is essentially a complex problem is examined and solved unilaterally. The elimination of such effects distracts a significant part of the scientific and technical potential.

Of course, today, we cannot know precisely what the undesired consequences of the practical implementation of new scientific-technical achievements will be in each concrete situation. But there is already sufficient experience to foresee the possibility itself of their arising and to be prepared for their liquidation. It is clear that, for this, it is necessary to rely on data from the whole complex of sciences. A special role belongs here to the social sciences, which are called upon to evaluate (and not only as a whole, but also at the level of individual, specific scientific-technical innovations) the results and trends in scientific-technical progress, from the point of view of the development of society and the individual. Unfortunately, far from all social scientists are prepared for this.

When science still more becomes a necessary condition not only for production and the economy but also for other spheres of social life, the very process of practical utilization (and to a certain degree also the achievement) of scientific-technical knowledge must become effectively planned and socially organized. It was not by chance that at the 26th CPSU Congress the introduction of scientific discoveries and inventions into practice was called "the decisive, most urgent sector" in the whole system of social production. For many years, this problem has been widely discussed in the party press and scientific journals. However, what we have found and have put into operation up to now is far from always satisfactory.

Of course, we have excellent examples of relationships between science and production: the Leningrad Optical-Mechanical Association and "Elektrosila" in Leningrad, the Institute imeni Ye. O. Paton in Kiev, and many others. The authors of a system for accelerating the introduction of scientific-technical achievements at the Moscow Automotive Plant imeni L. A. Likhachev recently were awarded State Prizes. In all, during the last six years, labor productivity here was raised by more than 40 percent. During the years of the last five-year plan as a whole, the enterprises of the country assimilated 1300 scientific developments prepared by institutes of the USSR Academy of Sciences jointly with ministerial science.

However, the picture as a whole is far from this comforting. Too often, as was noted at the 26th CPSU Congress, we come across intolerable delay in the assimilation of promising developments.

It is clear that the problem of introducing new technology -- or, more precisely, the problem of creating an up-to-date mechanism for the interaction of science and production -- deserves -- as it has for a long time! -- profound and comprehensive complex research. It is necessary to organize and begin it as soon as possible, because each year gained will turn into many billions of rubles saved. And not only with those rubles that meanwhile have been sunk into science as dead capital, but also with those, many times more, that could provide us with increased utilization of scientific results of practical significance.

The aforesaid also affects the interrelationships between science and other spheres of social practice such as education, health, and so forth. The necessity for interaction among the social, natural, and engineering sciences arises every time where a wide sphere of joint and purposeful activity of people has to be managed, be it a program for regional development or a program for mastering space, protection of the environment or the measurement, optimization, and motivation of labor activity, and so forth. The complex approach is needed here both for working out a program for the development of the respective sphere and for the implementation of this program.

3.

The strengthening of relations between science and practice also influences the development of science itself, generating new branches of knowledge at junction points among the social, natural, and engineering sciences.

Thus, in creating extremely varied and intricate technology, a substantial role belongs to a branch of knowledge that has arisen rather recently and is rapidly developing -- ergonomics. It has a special research objective -- "man-machine-environment" systems -- which it examines as units and in interaction. This complex approach is a necessary condition for creating new technology. The latter, possessing high productivity, reliability, and economy, should aid in achieving necessary social results -- the maintenance of people's health and the development of the individual in the labor process and increasing the content, effectiveness, and quality of human activity everywhere it has to come into contact with technology.

The development of ergonomics is a clear example that scientists increasingly are solving problems of social significance simultaneously with large scientific-technical economic problems. This is especially characteristic of scientific investigation in our day.

As a result, the process of introducing new technology now can no more be a matter of individual talented or skilled individuals, as it cannot rely on old organizational, financial, economic, and other elements of production. And to comprehend it in full is possible only through the integrated means of science which, as Comrade L. I. Brezhnev rightly stated, requires a break with outdated customs and indicators.

Without changing the structure of scientific knowledge that has evolved, the strengthening interaction among the social, natural, and engineering sciences is having increasing influence both on the methodology of scientific understanding and on the organization of scientific research.

Complexity is the most important feature of modern science, a necessary condition for precisely and completely representing a researched subject and for encompassing all its aspects simultaneously in their interrelationship. In modern science, the subject researched, as a rule, has to be examined not from the point of view of individual, relatively isolated aspects, but from that of a unified whole. This requires the unity of analysis and synthesis that V. I. Lenin wrote about as one of the elements of dialectics. This means that all sciences, without exclusion, studying any subject from various aspects, must always proceed from its integrated whole, taking into account the inseparability and the mutual influence of all its aspects and manifestations.

One of the most important and indicative results of increased interaction among the sciences is the emergence and diffusion in modern understanding of broad scientific approaches and methods (cybernetics, information theory, systems research, etc.), which find application in very diverse spheres of science and in the study of subjects of very diverse content. The further development of these scientific approaches and methods and their introduction into everyday practice is still the only way to strengthen the interrelationships of social, natural, and engineering sciences.

An increasingly noticeable role in bringing about the interaction of the sciences is being played by scientific philosophy. The methodological role of dialectical materialism in this is determined, above all, by the fact that the requirement formulated by V. I. Lenin, as one of the principles of dialectical logic, for the total grasp of the subject being studied, is now becoming a direct and immediate guide for widely diverse kinds of specialists.

At one time, V. I. Lenin said that "the continuation of Hegel and Marx should be in the dialectical treatment of the history of human thought, science, and technology (Complete Works, vol. 29, p. 131). Now, we rightfully can add that this should also be a continuation of the work of V. I. Lenin. Such a treatment is made easier by the fact that sciences in our day are being brought into closer interaction among themselves, thus revealing their commonality and unity.

4.

The intensification of interaction among the sciences cannot help but affect the very diverse aspects of scientific activity. They particularly engender new demands on a scientific worker who more and more has to participate in broad kinds of research. He cannot remain a narrow specialist, enclosed within the framework of his own discipline. He must see the place of his own discipline, his own research area, in the general science context and in the interrelationships between science and practice. It is not, of course, that he should know everything, but that he should see, understand, and consider broad interdisciplinary contacts and relationships and perceive them as nothing unusual, but as the norm, and he should be internally inclined toward this kind of intercourse.

Schools should now be preparing for this, above all, higher schools. Interdisciplinary contacts assume in the first place the assimilation of fundamental ideas by future specialists. And the more deeply they are successful in doing this, the more easily they will be able to be oriented in various disciplines and switch from one area of activity to another.

Thus, the problem of the interrelationships among the sciences revolves around still another of its aspects of principal importance -- the problem of searching for the optimum ratio among the fundamental, applied, and developmental elements in teaching.

The interaction of the sciences is fully the real and tangible interaction of scientific schools and areas, institutions and organizations -- VUZ's, institutes, laboratories, and individual scientists. And, of course, much here depends on the atmosphere, on so-called "human relations." It is important to constantly develop and deepen democracy within science, to persistently struggle against administration by fiat and against attempts to introduce relationships, methods, and ways of working in science that are alien to it and to our system. The atmosphere of creative discussions and criticism and self-criticism based on principle constitute a fundamental condition for the thriving and confirming of truth.

Characterizing the nature of social interrelationship among scientists, K. Marx looked upon any scientific work as a work of common labor, which "is dependent partly on the cooperation of contemporaries and partly on the utilization of the work of predecessors." (K. Marx and F. Engels, Works, vol. 25, part I, p. 116.) Under present conditions, when no country is able to guarantee uniformly high levels in the development of all science, the integration of effort by scientists of different countries is especially urgent. This is dictated not only by consideration of economic advantage: international cooperation permits the solution of conceptually new urgent problems that have been labeled the global problems of today, the uncoordinated attack on which has little promise. Soviet scientists are doing everything they can to develop such cooperation.

Today, science is acquiring increasing significance not only as a powerful factor in the development of production and of the economy, but also as an important factor in the intellectual life of society and in the political-ideological struggle. Broad interdisciplinary cooperation among scientists of various countries of the world at one time played a key role in the expansion of the social movement and in taking the specific political steps that led to banning nuclear tests in three environments. The 26th CPSU Congress appealed to eminent scientists of the world to show the whole world the vital necessity for avoiding nuclear catastrophe. This appeal to scientists' responsibility to world service, to the humanism of science, and to its authority is perceived with deep interest by the progressive world scientific community who are in the first ranks of the movement against the threat of nuclear war and against the arms race. Comprehensive scientific analysis of the consequences of such a war, which would be disastrous for mankind and for life on earth itself, in any of its scenarios, is a noble task, in the accomplishment of which representatives of the social, natural, and engineering sciences can make their contribution.

Realization of the close relationship between the development of scientific understanding and the life of society is a distinguishing feature of our national science, the best representatives of which have seen their highest obligation to serve the people. This feeling of social responsibility is even more characteristic of Soviet science which, at all stages in the development of our society, has very actively participated in the solution of social-economic, economic, and cultural-educational problems.

In generating a creative, efficient and, at the same time, morally pure environment for science, the chief role, of course, is played by communists and by party organizations of scientific institutions. They are called upon to bring about a situation whereby science actually becomes "the perturber of tranquility" -- the initiator of solutions to urgent problems, and doubles or triples its efforts to implement the unprecedented large-scale, complicated, and inherently complex tasks put forward by the 26th CPSU Congress.

9645

CSO: 1814/28

COORDINATING COLLECTIVE USE OF COMPLEX EQUIPMENT

Moscow PRAVDA in Russian 10 Jan 82 p 3

[Article by E. Andronikashvili, academician of the GSSR Academy of Sciences, director of the Institute of Physics of the GSSR Academy of Sciences, and USSR State Prize laureate, Tbilisi: "The Composition of Forces: The Effectiveness of Science"]

[Text] Technical equipment often becomes the focus of collective scientific creativity -- powerful accelerators, pulsed reactors, or large telescopes. Devices for thermonuclear synthesis -- tokamaks -- are today designed by forces of specialists from several countries and will become objects of international utilization (INTOR). Many items of space equipment are used on the basis of international cooperation. The cost of such equipment is enormous and, to justify the expenditures, it is necessary to "reap" the maximum scientific product from each of them by attracting many collectives to its work. "Collectivization" is one way to do this. It is not accidental that, in our day, an increasing number of so-called national centers are arising.

Of course, not all science is "made" in such spectacular places, but even research done in "ordinary" institutes is becoming more expensive. Calls for the creation of laboratories and computer centers for collective use are resounding more and more loudly. Usually, this refers to concentration of expensive equipment -- electron microscopes of various types (as is done in the laboratory of electron microscopy of the Institute of Metallurgy of the USSR Academy of Sciences), nuclear magnetic resonance devices (here, the Institute of Elementoorganic Compounds of the USSR Academy of Sciences has provided an example), and others. Such specialized units are useful in large scientific centers -- Moscow, Leningrad, Novosibirsk, and Kiev -- where there are many institutes that need these kinds of equipment only sporadically.

However, centers for collective use can arise both in smaller cities and in smaller institutes. But, as a rule, these are not centered on expensive equipment but on original devices based on local ideas and developed locally. It is a matter, above all, of small-sized and relatively cheap equipment created by hand, which can be placed in an experimental hall or even in one room.

"What kind of collective-use scientific center is this?" someone may ask me. "Can an experimental device intended for implementing individually conceived research bring representatives from various institutes together?"

As it turns out, it is possible. Paradoxical as it may seem, centers for collective use have often arisen specifically around devices that reflect the creative individuality of their creators. And this occurs not only within the framework of one city or country, but even on an international scale.

So as not to be accused of making unsubstantiated statements, I will cite an example from our Institute of Physics of the GSSR Academy of Sciences. Here, many years ago, it was decided to build a low-temperature channel that passes near the active zone of a nuclear reactor; it is cooled by gaseous helium having the temperature of liquid nitrogen, liquid hydrogen, and even lower. The need appeared in connection with the necessity for studying, over a wide temperature range, how defects are formed in the crystalline structure that arises from the effects of reactor radiation. The low temperature channel in the reactor is a unique device. And no one predicted that this cryogenic system would become a center of attraction for many institutes in Moscow, the Moscow area, Sverdlovsk, Khar'lov, and Kiev. Meanwhile, 12 institutions have conducted or are conducting work on it jointly with our institute, although many of them have their own reactors. But what sense would it make for them to acquire their own complicated cryogenic-reactor set-up if this kind of research is not going on continuously at our institute?

Practically all joint projects on low temperature radiation materials study are devoted to topics that are economically important. Among these, let me single out the problem of technical superconductivity, the study of which induced specialists from six institutes in other cities to participate in cooperative work. They are united in a general program by a scientific council of the USSR Academy of Sciences on the radiation physics of solids. Its bureau heads this special kind of "Super-conductor" scientific association. Valuable scientific output has been produced.

Another example. At the beginning of the 1960's, three groups of Soviet scientists started to create spark tracking chambers for monitoring high-energy particles. The Institute of Physics of the GSSR Academy of Sciences and the Moscow Engineering Physics Institute, independently of one another, concentrated attention on the development of what was later named the streamer chamber, and the Yerevan Physics Institute, on wide-gap spark chambers. In 1970, these three institutes were awarded Lenin Prizes, and streamer chambers found application at all large accelerators around the world.

At one time, associates of the Institute of Physics of the GSSR Academy of Sciences discovered an important phenomenon in cosmic rays that was called "a little bit of transverse pulse" in elementary particles. Wishing to continue this research on an accelerator, our institute went to the Joint Institute for Nuclear Research to cooperate in research on the problem of the physics of elementary particles at the Serpukhov Accelerator with the assistance of a relativistic ionization streamer chamber (RISK). In this cooperative effort, besides the Institute of Physics of the GSSR Academy of Sciences, there was participation by scientists from the Joint Institute for Nuclear Research and the Institute of Nuclear Physics and Nuclear Energy of the Bulgarian Academy of Sciences, as well as from physics institutes of the Hungarian People's Republic, the German Democratic Republic, the Polish People's Republic, and the Czechoslovak Socialist Republic.

For the RISK device, specialists of our institute constructed and prepared a streamer chamber five meters in length. This instrument, which has no analogs,

substantially enriched the arsenal of means for high-energy physics. The collective of scientists from six socialist countries managed to solve complicated fundamental problems in the physics of elementary particles that for each institute separately (except for the Joint Institute for Nuclear Research) would have been impossible to do.

Cooperation is also fruitful with respect to molecular biophysics, originating again on the basis of the Institute of Physics of the GSSR Academy of Sciences in connection with the creation of a new instrument -- a scanning differential microcalorimeter. Originally, it was attempted to use it to undertake to verify the hypothesis according to which the thermal properties of "cancerous" molecules of deoxyribonucleic acid (DNA) and its whole genetic-cell apparatus should differ from the norm. The sought-for effect was actually discovered. It was ascertained that chromatin extracted from marrow cells of severe leukosis patients melts at temperatures 11 degrees higher than chromatin taken from healthy people. Thus, such measures can serve as a means of diagnosis. This research was conducted jointly with the Institute of Hematology and Blood Transfusion of the GSSR Ministry of Health. In 1978, USSR State Prizes were awarded to associates of the Institute of Physics of the GSSR Academy of Science, the Institute of Proteins of the USSR Academy of Sciences, and the Special Design Bureau for Biological Instrument Making of the USSR Academy of Sciences, for creating a new biological research method.

Our biocalorimeters operate over a wide range of temperatures -- from 4 degrees Kelvin to 100 degrees Celsius. Could we use them only to conduct our own research? Of course. But this would not be good practice! Institute scientists would be deprived of creative contacts that often enrich us. Research on these devices has been conducted by scientists of a number of institutes in Moscow, the Moscow area, Leningrad, Tbilisi, and also in Hungary, the GDR, Poland, France, the FRG, Yugoslavia, and the United States. It seems that it would be worthwhile to form a biocalorimetric center for CEMA countries, based at the Institute of Physics of the GSSR Academy of Sciences, and to plan a program for joint projects in the fields of fundamental biophysics, medical biophysics, and agrobiophysics. It can be stated with confidence that such a center would be useful to all those participating in its creation.

In general, the significance of individual creativity becomes apparent with special clarity when it grows into collective scientific investigation. But many difficulties are found on this route. For joint interinstitute research, a device created through one's own efforts is insufficient; it must have a set of standard instruments. The institute is not always able to provide them to visiting experimenters. This means that joint research requires appropriate material and financial support. In addition, the contribution of various institutes, from the point of view both of material and labor expenditures, often turns out to be very uneven. Perhaps, there are also differences in the scientific contribution.

Of course, these and other difficulties can be overcome if institutions of one agency are cooperating. But often management by scientific councils of the USSR Academy of Sciences happens to be needed. One of the chief concerns of such councils, it seems to me, should be to provide incentive for interinstitute creative collectives to arise around unique research equipment like the "Superconductor." But it is one thing to provide incentive and another to create conditions for such cooperation. Cooperation, especially multilateral cooperation, often arises among institutes of various subordinations. And, one should think, effective assistance here could be given by the USSR State Committee for Science and Technology.

ACTION URGED ON SCIENTIFIC INSTRUMENTS SHORTAGE

Moscow SOVETSKAYA ROSSIYA in Russian 22 Nov 81 p 2

[Article by L. Piruzyan, corresponding member of the USSR Academy of Sciences and a doctor of medical sciences, G. Barenboym, professor and a doctor of physical-mathematical sciences, and A. Malenkov, professor and doctor of biological sciences: "The Tools of a Scientist: A Letter on an Important Topic"]

[Text] It is considered, with justification, that scientific instrument making is a foundation for the development of all modern natural sciences. "We all understand very well," wrote A. P. Aleksandrov, president of the USSR Academy of Sciences, in one of his articles, "that the scientific activities of the academy, at least in natural and engineering sciences, are extremely closely tied to supplying laboratories with modern equipment, and I would even say, ultramodern equipment. Only the laboratory that possesses really good apparatus is able at the present time to make contributions to science at the needed rate."

How well, then has our science been provided with equipment and reagents? In the field of unique instrument making (accelerators and telescopes, for example), where one or two instruments are created, we occupy a leading position or, at least, we create instruments that correspond to the highest world standards. But the field of mass technology for scientific experimentation does not always correspond to world standards either in quantity or quality of instruments.

One can judge the level of development of scientific instrument production in our country by the status of analytical instrument making, which is important not just for scientific research, but also for controlling production processes in chemistry, pharmaceuticals, and metallurgy, and for clinical laboratories and environmental protection ... One of the most important groups in analytical instrument making is that of spectrophotometers. The number of types of these instruments is obviously limited, and the quality does not always correspond to modern requirements. But even for such instruments as these, the demand is not satisfied by more than 20 percent.

It seems to us that the inevitable demand for instruments of low quality plays a fatal role and helps industry to remain deaf to the new ideas of scientists in the field of scientific instrument making. Then there are these paradoxes. The method for electronic paramagnetic resonance was developed for the first time in the USSR

as far back as 1944, but companies of the capitalist countries control the international market for the corresponding instruments as well as producing instruments of the highest quality.

The limited capabilities of domestic design bureaus and factories are coming to a state where they have practically no ability or means to assimilate the "amateurish" developments created in the laboratories of scientific-research institutes and VUZ's, which often represent essential steps in scientific instrument making, not lagging a bit, but even surpassing foreign models. This is also true of reagents for science.

It is obvious that it is necessary to have very close organizational contact between scientists and instrument-making organizations. This helps the mutual enrichment of both parties with ideas, the application of new principles to instruments, and new instruments in research.

There is an unsatisfactory situation in the matter of importing instruments, where there is also an absence of a unified policy. Instruments are purchased for the same purposes from various companies, and often they are far from the best models. Many exhibitions of foreign instruments are held in our country; however, no competition is conducted among them. Review of the quality of instruments and recommendations for purchase are either totally absent or do not reach the consumer. A number of the companies that sell us instruments do not provide service for them. To acquire spare parts in the process of operating the instruments is extremely difficult.

The utilization of the experimental methods that are created in scientific institutions have fundamental significance. However, if these methods are created on imported equipment, their introduction into the economy, as a rule, is delayed for years -- it is necessary either to revise the method for domestic instruments or to create a Soviet analog of the imported instrument which, in turn, causes the loss of time in overcoming a dense net of patent rights.

It is evident that international cooperation by our country in the field of series production of scientific instruments is insufficiently developed.

Finally, let us point out one of the chief consequences of the insufficient technical supply of instruments to our domestic science: imported technology is available only to a narrow circle of scientific institutions. Corresponding domestic analogs, as a rule, are either put out in insufficient numbers or do not exist. Under these conditions, many outlying scientific-research institutes cannot use their scientific potential.

It is difficult even to imagine how many brilliant scientific achievements that promise a large economic effect, have not come about because of the lack of appropriate technology for experimentation.

One of the reasons for the situation that has arisen, as we see it, is that there is still no summary document that would reflect the needs in the field of scientific instrument making and, correspondingly, there is no summary plan for development. There is no unified center that determines state practice in this field,

information service has not been set up, and the rental of scientific equipment is making feeble progress.

What are the ways, then, that the situation in scientific instrument making can be overcome?

It seems advisable to us to form, as soon as possible, an interagency council on scientific instrument making under the USSR State Committee for Science and Technology and the appropriate section of USSR Gosplan. The main purpose of the proposed organizational measures is to create enterprises technically capable of developing instruments or reagents for science. It is also necessary to use existing associations in economic sectors, after having switched some of them fully to the tasks of providing a material base for scientific research.

It is very important to have maximum mobilization of the creative and, especially, the inventive potential of the country. For this, in turn, it is necessary to create a flexible system for attracting scientific workers, inventors, and engineers to the development, the assimilation of the technology of, and the manufacture of scientific instruments, without separating them from their basic positions in scientific research institutes, VUZ's, or industrial enterprises, and to permit combining these two kinds of work as is permitted in relation to teaching positions. It is very important that a scientist or inventor, according to whose idea a development or creation of a reagent takes place, possess the rights permitting him to control compliance in technical execution.

In the future, probably, it will be necessary to have a state body (for example, a State Committee for Scientific Instrument Making) which would be responsible for the development of the sector as a whole.

Scientific instrument making is a foundation for coming achievements in many key fields of the economy and for technical progress; it is one of the components of the country's international prestige, and its development is undoubtedly among the problems of state importance that require immediate solution.

9645

CSO: 1814/21

PARTY ACCELERATES INTRODUCTION OF NEW TECHNOLOGY

Moscow SOVETSKAYA ROSSIYA in Russian 5 Jan 82 p 1

[Editorial: "Party Committee Concern about New Technology"]

[Text] Great difficulties were encountered by the collective of a new shop for precision shapes of the "Izhstal" production association. The shop was built and supplied with modern equipment, but no one wanted its products. Meanwhile, the application of precision shapes promised a strong advantage to the state -- both in reducing the use of metals and in conserving human labor. Metallurgists began to manufacture stocks of extremely complicated configurations, and with minimum tolerances. Consequently, the necessity for subsequent mechanical processing declined, and the coefficient of metal utilization increased. But the obvious advantages of the new products and steel are themselves an obstacle on the road to the users.

Plant directors refused to take the precision stocks, giving as reasons that there would be "cuts in funds" for metal, that there would be "superfluous" lathe and milling-machine operators, and that "laid-off" production would have to be reorganized. In general, there were plenty of excuses. Weeks and months went by, and the powerful complex that had been put into operation was still without orders. It was then that its managers requested aid from the party committee of the association in overcoming the psychological and bureaucratic barriers.

The party committee approached the matter very seriously. Here, of course, they understood how difficult it was to overcome the lethargic views of certain engineers and the "Piyushkinesque ways" [reference to the miserly landowner in Gogol's "Dead Souls"] of other, too thrifty administrators, trying every possible way to obtain more metal so that a good half of it could be turned into shavings. Nevertheless, the party committee undertook the problem without delay.

For a start, colored catalogs of the manufactured items were prepared and sent around to many plants and factories, to central planning bodies, and to machine-building ministries. In accord with a party committee proposal, special promotion teams visited the largest metal-consuming centers. As a rule, party activists from "Izhstal" went along. Soon, tens of kray, oblast, and city party committees also began to publicize the introduction of the new products in their localities. Thus, a very critical problem in selling new kinds of stocks to machine builders was successfully removed from the agenda. Now, "Izhstal" manufactures about 4000 types

of precision shapes, which have found application in hundreds of domestic plants and in 25 foreign countries. Many millions in economic effect have been received from their utilization in the economy.

History is extremely instructive. It has again shown what great opportunities are available to a party committee of an industrial enterprise to accelerate the rates of technical progress if it operates energetically, on a large scale, and with purpose and if it is supported by a wide circle of progressive-thinking specialists. It must be stressed that the means used to solve this complicated economic, technical, and moral problem were the usual means of party influence, available to any primary party organization.

As was noted at the 26th CPSU Congress, the 1980's will be affected by a number of factors that will complicate the economic development of the country. Among them are the reduced growth of labor resources and unavoidable increases in expenditures for environmental protection. All this gives first priority to concern about the development and application of labor-saving and waste-free technology in all economic sectors. And here, party committees can accomplish much. It is sufficient to make reference to the proven practice of the Tula gorkom of the CPSU. Plans for social development in the city are closely coordinated with tasks for accelerating the introduction of new, effective technological processes. A group of people from Tula, as is known, have been awarded a Lenin Prize for creating a facility for continuous steel casting.

Wide recognition has also been received by other technical innovations developed by complex creative teams of scientists and producers that were formed by party committees outside administrative channels. The introduction of these innovations reduced the need for manual labor and lessened technological waste. During the 10th Five-Year Plan, Tula industry increased product output by more than 20 percent, while reducing the number of production personnel.

The times call for a smaller number of workers to fulfill increased plans. The problem is complicated, of course, but it nevertheless can be completely resolved. Convincing evidence of this is the work of Yaroslavl' motor builders, Chelyabinsk pipe-makers, and many labor collectives of Permskaya and Kuybyshevskaya Oblasts. It is important that valuable experience everywhere be put to the service of the five-year plan. A reminder of this is necessary because there are still some ministries and project-design institutions and still some local managers who have not been oriented toward economical labor-saving production processes in determining development paths for enterprises and construction for new factories and plants.

An obvious model of how to make an economy economical, to achieve maximum results with less expenditures, has been exhibited by party organizations of Sverdlovskaya Oblast. During the past five-year plan, for the rebuilding and re-tooling of production, the Sverdlovsk people used a third of all allotted capital investment, in return for which they achieved a 50-percent growth in volume. They saved the state 500 million rubles, which would have had to be spent on new construction to achieve the same increase in product output. In the current five-year plan, half of the capital investment is already being directed toward the goal of reconstruction, and the net gain to the state will exceed a billion rubles.

Unfortunately, the good Sverdlovsk initiative has not found practical, constructive support everywhere. Already, during several five-year plans, the management of the Kuznetsk Metallurgical Combine has placed before the Ministry of Ferrous Metallurgy the question of radically reconstructing the enterprise; however, comprehensive measures have yet to be adopted. Most alarming of all is the obviously extended delay in developing supply organizations for production, the auxiliary shops; this, in the final analysis, will have a negative effect on the work of a whole collective of many thousands.

It is no secret that agency alienation and jurisdictional tendencies cause great losses to technical progress. In overcoming these, there is a large role for party organizations, which are called upon to stand guard over national interests. The Leningrad obkom and the Krasnoyarsk kraykom managed to concentrate the efforts of collectives of tens of scientific-research and design institutes, production associations, and plants, all subordinated to various agencies, on the creation of unique machines and assemblies for the Siberian power industry, and will something interfere with making use of this experience, which has been approved by the CPSU Central Committee, to implement other large special-purpose programs?

Under conditions of an unfavorable demographic situation, exceptional significance is acquired by the need for all possible increases in labor productivity. It can no longer be tolerated that every fifth Russian enterprise fails to fulfill planned tasks according to the most important growth indicators. It is necessary to analyze carefully the reasons for the noticed lag and to eliminate them immediately. As first priority, there must be concern about more rapid introduction into production of effective scientific-technical achievements. And here, existing experience must be fully utilized. The work of the council for support of technical progress of the Novgorod CPSU gorkom particularly deserves attention. In it are united over 400 leading specialists of the city and party, Soviet, and trade-union workers. Through the efforts of the council, a regional complex system for product quality control has been created. It is now developing a whole system for controlling the growth of labor productivity. The complex, program approach is also having good results here.

During the 11th Five-Year Plan, our country intends to increase the rates of technology renewal by a factor of 1.5; this will make new, increased demands on scientific-research and design institutions, planning bodies, managers of economic sectors, and enterprises. The responsibility of their party committees will grow many times over with respect to the development and correct, zealous utilization of the machines, assemblies, and mechanisms that are being created. First of all, they must be sent where they will produce the most rapid return. The mechanization and automation of production and all possible reduction of manual labor should be a subject of special concern for party organizations.

Accelerating the rates of technical progress is not only an urgent economic task, but it also is a serious moral problem. New, highly productive techniques and technology of production, which has grown more complicated, requires a sharp rise in the vocational and general educational level of workers, better organization and labor discipline, more personal responsibility for the state of affairs in the shop, on the farm, or at a construction site. The inculcation of these qualities in people and the creation of an atmosphere of intolerance for any manifestation of routine psychology also should be the subject of organizational and mass-political work of party organizations.

INDUSTRY'S NEGLECT OF PROGRESSIVE TECHNOLOGY

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 3 Dec 81 p 2

[Article by B. Nazarov, board member and a section chief of the State Committee for Inventions and Discoveries: "Innovation on the Scales of Economics; How Can the Introduction of New Technology Be Accelerated?"]

[Text] No one now has to be convinced that the creation of advanced technology and highly effective technology is inconceivable without constant utilization of new progressive inventions.

It is sufficient to say that during the 10th Five-Year Plan the quantity of inventions introduced for the first time increased in comparison with the previous five years by a factor of 1.6, and the economic effect from their utilization grew by a factor of 3 and exceeded 8 billion rubles. Correspondingly, the growth in foreign exchange receipts from license sales increased fivefold.

Nevertheless, these figures are not reassuring. Because, if a comparison is made between the possibilities that have been realized with those we have not realized, the picture is not cheerful.

In only one year, 1980, at enterprises of the Ministry of Construction, Road, and Municipal Machine Building, for example, a total of 9 inventions were introduced with an economic effect from the utilization of each exceeding a million rubles. The Ministry of Nonferrous Metallurgy utilized seven such inventions and the Ministry of the Machine Tool and Tool Building Industry, three. Cast aside are tens of other no less significant innovations, the utilization of which could perceptibly affect technical progress in these economic sectors. But instead of these, enterprises of these ministries introduced thousands of other inventions -- insignificant, ineffective, not even justifying the expense of their development. It is not surprising, therefore, that the economic effect in 1980 from utilizing inventions in the Ministry of Power Machine Building, the Ministry of the Electrical Equipment Industry, the Ministry of the Gas Industry, the Ministry of Heavy and Transport Machine Building, and the Ministry of Machine Tool and Tool Building Industry, despite the large number of these inventions, was only 20 to 40 percent of the expenditures for scientific-research and experimental-design work. And, in the Ministry of Chemical and Petroleum Machine Building and the Ministry for Instrument Making, Automation Equipment, and Control Systems, this indicator has a very meagre size -- 7.9 percent and 9.6 percent, respectively. Thus, a majority of research

collectives possessing strong scientific staffs, work at a loss to their economic sectors.

This is what Comrade L. I. Brezhnev was speaking about in discussing the draft State Plan for the Economic and Social Development of the Country, at the November (1981) plenum of the CPSU Central Committee: "In accord with the draft plan, the rates of technology renewal will grow roughly by a factor of 1.5. This places large and responsible tasks before scientific-research and design institutes.

"Unfortunately, many of them are not operating as they need to at the present stage of scientific-technical progress. Proposed engineering and technological solutions often do not respond to this level."

The reason for this situation has long been known -- a small, insignificant invention is much easier to put into practice than are pioneering, highly effective ones that sometimes require radical reconstruction of production. But, in a number of ministries and agencies, the approach to the work of enterprises and organizations on invention is formalistic, requiring only a certain quantity of inventions to be introduced.

This is statistical "prosperity," but puts a barrier before real, highly effective new technology, such as, for example, machines for pulsed cutting of metal (MIR) created by the Khar'kov Aviation Institute back in the 1950's. This invention has been protected by 54 authors' certificates in the USSR and has been patented in the United States, France, FRC, Canada, Italy, and other countries.

The application of MIR machines especially in a unified technological line with continuous steel casting, provides for full automation of the stock cutting process, reduces the use of gas by a factor of 10, and permits yearly savings of up to 200,000 tons of metal. It is not surprising that the USSR State Committee for Inventions and Discoveries for 10 years has constantly recommended that series manufacture of MIR machines be included in the plan for the Ministry of Heavy and Transport Machine Building.

However, workers of the ministry by all means are rushing to take on the burden of worrying about the organization of manufacturing for this progressive technology at its enterprises. True, at the beginning of the 11th Five-Year Plan, the Southern Urals Machine Building Plant of the Ministry of Heavy and Transport Machine Building put out a small quantity of MIR machines. But this quantity in no way could satisfy ferrous metallurgy -- it requires more by a factor of tens.

Back in 1949, an experimental facility was created in which a process was worked out for producing hydrogen peroxide by a promising anthraquinone method created at the State Scientific Research Institute for the Chemistry and Technology of Elementary Organic Compounds of the Ministry of the Chemical Industry. In 1951, two years earlier than in the United States, experimental industrial production of hydrogen peroxide by the anthraquinone method was put into operation.

Its chief advantages in comparison with other methods are a high degree of economy, better product quality, and the absence of production by-products. It was not without reason that in 1966 the Swedish company "Elektrokemiska A.B." bought a

license in the USSR for the anthraquinone method and, two years later, had mastered its industrial production and since then has been advertising this Soviet technology throughout the world as the most economical and the most improved technically. In subsequent years, licenses for this technology were sold to Bulgaria, Poland, and Turkey.

But how many licenses were not sold? Alas, many more. More than 20 large capitalist companies displayed interest in the Soviet anthraquinone method for producing hydrogen peroxide and were prepared to begin negotiating to purchase licenses . . . if we could show it to them in operation. But the anthraquinone production facility for hydrogen peroxide, under construction at the Usol'ye production association "Khimprom" up to now has not been put into operation. Of the total estimated cost of 16.3 million rubles only 3.2 million has been used. And, despite all our proposals, the Ministry of the Chemical Industry is not doing anything to push work on this construction.

Another example: In 1972, a worker in the Main Administration for Housing and Civil Construction in Moscow, Z. Shokhrin, with coauthors, developed an original hydrocombine for earth work in direct proximity to operating communications -- under conditions where exclusively manual labor has been applied up to now. Tests by workers' organizations and an experimental model of the hydrocombine confirmed the correctness of this technical solution and the possibility for its utilization with productivity higher than existing manual technology by a factor of 5. Companies in Japan and France displayed interest in this innovation.

But despite many recommendations by the State Committee for Inventions and Discoveries to the Main Administration for Housing and Civil Construction in Moscow, the Main Administration for the Construction of Engineering Structures in Moscow, and the Moscow ispolkom to accelerate the exploitation of the invention, industrial testing of the machine has not yet been completed. The only model of the hydrocombine has stood for two years in the open air, is falling apart, and rusting. And it still has not been determined what organization will put the machine in working condition. And, meanwhile, at both the Main Administration for Housing and Civil Construction in Moscow and the Main Administration for the Construction of Engineering Structures in Moscow, invention work is at a high level, judging by the reports -- every year, a notable quantity of "comfortable" inventions is introduced into production; they do not have much benefit, but also they do not require a great deal of work.

However, it is not only highly effective, pioneering inventions that have to beat their own paths into industry. Such a fate also befalls large scientific discoveries that have to wait their "turn" for years, although their necessity for expanding the economic potential of the country causes no doubts.

Almost 20 years ago, the discovery "Effect of Nonabrasiveness on Friction (Selective Transfer)" was registered in the USSR -- a discovery that could introduce really revolutionary changes in production. Skillful utilization of the phenomenon that was discovered would permit sharp reductions in friction and would almost completely eliminate wear on working surfaces. More than 300 published works, over 100 authors' certificates, and 30 candidate dissertations make up the contribution by science to the preparation of this discovery for practical utilization in industry.

A large amount of experience has been accumulated on expanding the effect of selective transfer and the creation of materials and lubricants that provide for nonabrasive friction.

Practice has demonstrated the promise of this work. As a result of applying new metal-clad lubricants in aircraft engineering, the load capacity of friction points was increased by a factor of from 3 to 5. In shipbuilding, the selective transfer effect permitted the solution of the complex problem of replacing oil lubrication with seawater lubrication. The application of new wear-resistant materials in the construction of water pumps increased the intervals for equipment maintenance by a factor of 10, providing over 1.5 million rubles' yearly savings. And new additives for lubricating oils for friction points in internal combustion engines for motor vehicles, tractors, and agricultural machinery could provide hundreds of millions of rubles of economic effect if they were to be introduced.

Up to now, however, the introduction of the selective transfer phenomenon into industry has been accomplished, basically, through the initiative of individual enthusiasts and certain enterprise and organization managers, and it has not attracted the attention of a single machine-building ministry. And, above all, nonabrasive friction should be widely used in the products of the Ministry of the Automotive Industry, the Ministry of Tractor and Agricultural Machine Building, and the Ministry of Machine Tool and Tool Building Industry.

The responsibility for insufficient utilization of very significant inventions and discoveries in our national industry up to now belongs, first of all, to ministries and agencies. It is not without reason that they are called the staffs of the economic sectors. And who, if not the staffs, should determine the strategy for implementing the very important goal of the party to increase the effectiveness of the economy.

COMPREHENSIVE 20-YEAR PROGRAM OUTLINED

Tbilisi ZARYA VOSTOKA in Russian 10 Dec 81 p 3

[GruzINFORM article: "The Complex Program: Prospects for Creation"]

[Text] The ever growing role of science in the life of Soviet society is clearly illustrated by the complex program for scientific-technical progress in the USSR over the next 20 years. The contents of the complex program, its aims, and tasks were elucidated by the report of Academician V. A. Kotel'nikov, vice-president of the USSR Academy of Sciences, presented at the international symposium "Forecasting Science and Human Requirements," which is now taking place in Tbilisi.

The complex program has been called upon to provide the basis for the main directions in scientific research and in the development of scientific-technical and general-educational potential of the country, for the main directions for scientific-technical progress in the economy, and for the social-economic preconditions for and consequences of introducing science and technology into the economy.

The development of this important document was accomplished under the direction of the scientific council on problems of scientific-technical and social-economic forecasting of the USSR Academy of Sciences and the USSR State Committee for Science and Technology in 27 areas. In the work on the complex program, there was participation by about 2,000 scientists and specialists who represented over 500 scientific-research, project-planning, and design organizations of various ministries and agencies. Workers from USSR Gosplan actively participated in discussions of the program materials.

In the process of preparing the program, the necessity was revealed for additional development of individual scientific-technical problems, which served as the basis for subsequent formulation of individual special-purpose programs. Thus, a specific program will have to be prepared on the mechanization of manual labor, following the development and production of the necessary equipment. Analogous programs should be utilized with the goal of developing machine building, ferrous metallurgy, and other sectors. It has been indicated in the complex program that increase in agricultural products can be achieved, above all, by decreasing losses in transportation, preservation, and processing, and also through biological factors -- the introduction of achievements in genetics and selection.

One of the conditions for automating processes and increasing labor productivity is the utilization of electronic control machines and computers. It is proposed to

create a program, the implementation of which would provide for rapid growth in the manufacture of computers and their improvement.

The complex program determines priorities for the development of various areas of scientific research. In accord with potential possibilities that are being opened up for mankind, special attention is given to electronics, energy, including work on thermonuclear synthesis, new technology, agricultural questions, weather prediction and changes in climate, including those caused by human activities, study of earth structure, improvement of exploration for useful raw materials and fuel, and medicine, especially with respect to the most widespread diseases. In addition, according to the program, it is necessary to continue intensive research on the processes of living matter at the cellular and molecular levels, nuclear physics and the physics of elementary particles, and space. In the humanities, special attention is proposed for the social and economic processes in present society. Rapid progress in priority areas will also aid the development of other divisions of science.

The long-term program is directly tied to the dynamics and scale of expenditures on scientific development. The complex program outlines the scales for the development of instrument making that are necessary to support science.

A significant place in the program is given to problems in personnel training. Considering the length of the training cycle for specialists, it is already necessary to plan the training of scientific workers and other specialists that will become especially necessary in ten years.

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ESTONIAN SSR DEVELOPS 20-YEAR S&T PROGRAM

Tallinn SOVETSKAYA ESTONIYA in Russian 10 Dec 81 p 1

[Interview of I. Yyeryuyut and T. Rayasal, candidates of economic sciences, by A. Favorskaya: "Probing the Future"]

[Text] The ESSR Council of Ministers has adopted a decree on the development of a complex program for the scientific-technical progress of our republic for 20 years and an outline for the development and distribution of its productive forces to the year 2000.

The development of the program and the outline has been assigned to the ESSR Academy of Sciences. The Institute of Economics of the ESSR Academy of Sciences has been designated the chief developer.

For comments on the adopted decree, the editors turned to the directors of the projects, I. Yyeryuyut and T. Rayasal.

[Correspondent] As is known, the outline for the development and distribution of productive forces over the long term is drafted periodically in our republic. At the same time, the program for scientific-technical progress, which is also a complex program, will be drafted for the first time. What causes the necessity of having both "alternatives"? What are their goals and how will they interact?

[I. Yyeryuyut] The need for a long-range complex program for scientific-technical progress is caused by the general necessity for improving planning in our country. The program for scientific-technical progress has been formulated for 20 years, and every five years, as necessary, it will be refined. Its purpose is to precede the development of the Basic Directions for the Economic and Social Development of the USSR for ten years and to serve in certain measure as a foundation for them.

We are speaking now, you understand, about the all-union complex program for scientific-technical progress. The republic program is a constituent part and falls in the summary section "Regional Problems of Scientific-Technical Progress." Our republic program should take into consideration and reflect local peculiarities in the accomplishment of social-economic and scientific-technical development, the utilization of natural and labor resources, and production and scientific-technical potential for producing the highest end economic results. Of course, the program proceeds both from the scientific-technical level that exists at the present moment and from the forecast evaluation of future areas of scientific-technical progress.

Essentially, this is a system of stage-by-stage solution of the central problems in the creation and introduction of new engineering and technology, new forms of organization and management under our specific conditions, and with our specific resources.

[T. Rayasal] This is also important: the program for scientific-technical progress, as already noted, is complex, that is, it considers problems and solutions for whole complexes that fall between economic sectors. And these structures do not coincide with traditional economic sectors by which planning is conducted. Regrouping is required insofar as, let us say, the agroindustrial and industrial spheres often overlap. Therefore, simultaneously with the complex program for scientific-technical progress, the regular traditional outline for the development and distribution of the productive forces of the Estonian SSR will be developed. It is being put together exactly according to the structure of the economy as established for planning and management. Essentially, these are the scientific preplanning materials that served as the assumption basis for the preparation of the Basic Directions for the Economic and Social Development for 10 years and also more specific tasks for the next five-year plan. The outline for our republic also is a constituent part of the general outline for the country being developed for no less than 15 years.

The overall logic is this: the program for scientific-technical progress must, in concept, "see" five years beyond the outline and must create an information base and think through the technical possibilities that will provide the basis for putting together the outline. Thus, the program for scientific-technical progress that has now been assigned to us covers the period up to the year 2005, and the outline, up to the year 2000.

The first of these, the program, studies and probes the future more as a possible path of development, in the sense of basic directions for progress in science and in the social-economic sphere. This, let us say, is a necessarily optimistic forecast. From it evolves a general picture about what we ought to work for, considering both our resources and our total strategy for the development of the country's productive forces, that is, taking into account also the objectively existing limitations.

The outline, on the other hand, should accomplish more specific tasks and determine the possibility for development of the republic in accord with conditions that are intentionally more strict. Here also, going beyond the framework of the five-year plan, are problems in the development of energy, extraction of phosphorites, and the picture of possible regional planning, more rapid or slower development of cities, housing construction and the migration of population to specific regions, and so forth. Perhaps, our outline, too, turns out not to be exact -- life has its unforeseen amendments. But, if problems are explained in a timely way, it will be possible for the economic scientists to have fulfilled their task.

[Correspondent] What kind of forces have been enlisted in the development of the program and the outline?

[I. Yyeryuyut] For putting together the program, there are almost 190 organizations, including 77 scientific and design organizations, 52 ministries and agencies, and as many associations and enterprises.

[T. Rayasal] It is hard to tell yet how many are working on the outline. In principle, about as many as on the program. The main thing is that these forces must be well coordinated. A very large amount of work has been assigned to us, and we must finish it by 1983.

NEW ESTONIAN S&T INSTITUTE EMPHASIZES MOLECULAR BIOLOGY, GENETIC ENGINEERING

Tallinn SOVETSKAYA ESTONIYA in Russian 23 Dec 81 pp 2-3

[Article by Yu. Siygur, scientist-secretary of the Institute of Chemical and Biological Physics of the ESSR Academy of Sciences and a candidate of chemical sciences: "At the Junction of Sciences, With an Entry to Practice: The New Institute of Chemical and Biological Physics of the ESSR Academy of Sciences Is in Operation"]

[Text] Physical-chemical biology is one of the promising areas of modern science. Research in this field, on the border between physics and chemistry, opens up new opportunities to study the essence of life. Physical methods put very delicate means for research into the hands of scientists for research on the structure of vitally important compounds -- DNA, RNA, and enzymes.

Our institute, created in February 1980, includes so far only three sectors -- physics, biochemistry, and molecular genetics. It must be noted that the institute did not arise in a vacuum, but was based on sectors of the Institute of Cybernetics and the Institute of Physics of the ESSR Academy of Sciences, which at that time had already created a solid scientific potential. Thus, the physics sector, which recently noted its 20th anniversary, came to us from the cyberneticists. At the junction of these two areas of research, the projects of the new institute are continuing to develop in close interpenetration of the sciences.

What are the specifics of these projects that give them their own character? Above all, there are unique spectroscopic methods for research on the structure of matter. This has brought international recognition to the physics sector, where the methods were developed. One of these is the nuclear magnetic resonance method. Using this method, it is possible to obtain new information on the structure of matter, including biopolymers. Knowledge of the structure and the delicate mechanisms of activity of these high-molecular compounds, which determine the most important processes of an organism's life, opens up possibilities for their detailed study and, consequently, for subsequent practical application.

The possibilities for utilizing the nuclear magnetic resonance method, of course, are still far from exhausted. The sector is constantly searching for and finding new ones and is improving its equipment. One such technical solution has been patented in nine countries, including such countries as Canada, the United States, and others.

It must be noted that the complicated subjects and equipment that institute researchers work with require the automation of experiments and the use of computers. All this has become standard practice here.

The fact that our institute is a kind of complex where various specialties are represented creates possibilities for solving a number of important problems in physical-chemical biology. We felt satisfaction when our choice of problems concided with the recently issued decree of the CPSU Central Committee and the USSR Council of Ministers "On the Further Development of Physical-Chemical Biology and Biotechnology and the Utilization of their Achievements in Medicine, Agriculture, and Industry." At that time, the institute had already been entrusted with the additional task of developing ways to optimize microbiological synthesis. This process is understood as the formation of various chemical substances brought into being by microscopic organisms. What does it mean to find ways of optimizing? This means finding ways to consciously change the parameters of the processes. A whole cycle of projects in the biochemistry sector is related to this. Their main goal is to explain optimum conditions for such synthesis and to automate the processes. It is a matter, in growing microbes and bacteria, of having to follow many parameters and, without automation, it is almost impossible, because the processes here are very long and difficult to control.

Within the framework of the republic scientific program "Preparational Biochemistry" in the biochemistry sector, methods are being developed for production of the latest biological preparations for application in research and medicine. The institute has proposed a number of methods for producing pure proteins and enzymes for polypeptides from animal raw materials. Together with the experimental plant of the Institute of Chemistry of the ESSR Academy of Sciences, the institute has already introduced many methods into experimental production, and a number of preparations are also being exported abroad, including to the United States. A very important preparation has been developed, for example, for the study of photosynthesis -- the basis for plant life. For this, there is an author's certificate, "Means for Producing D-ribulose 1.5 diphosphate." Another enzyme (lipase) has great significance for the study of the vital activity of an animal organism and Moscow State University has obtained it from us for their own projects. We make still another pure biological preparation (its methodology was developed together with the All-Union Institute of Applied Biology) for the country's scientific-research institutes that are studying the structure of nucleic acids.

In producing pure biological preparations, the process requires enzymes and it is important to prolong their "life" so that the same enzyme may be used several times. For this, an enzyme is immobilized -- "planted" in a nonsoluble carrier, which keeps it from being used up while it is working. One of the best carriers turns out to be agarose from algae, which up to now has been purchased with foreign exchange. Our researchers, together with the department of organic chemistry at Tartu State University and the academy Institute of Chemistry has successfully introduced at the experimental plant of the latter institute the production of modified agarose from domestic raw material.

The most recent sector of our institute is the molecular genetics sector. One of its research areas is gene engineering. Gene engineering is now a very fashionable branch of physical-chemical biology. This is the artificial introduction of

synthetic or natural human, animal, or bacterial genes into the gene (hereditary structure) of bacteria to produce proteins and enzymes that the bacteria themselves cannot manufacture. But such substances are often vitally necessary. For example, insulin is produced in the pancreas and is necessary as a medicine in human diabetes. Of necessity, it is obtained from the organism of swine but, in some cases, the human organism rejects a substance from another species. But if this same human gene that produces insulin is introduced into a bacterium, it begins to produce insulin there of exactly the same structure as in the human organism. In general, very many biologically active substances can be obtained through gene engineering methods. The molecular genetics sector of our institute (it works in close cooperation with scientists at Tartu State University) studies, for example, an unusual subject -- plasmids. The aim of such research is to obtain bacteria that can rapidly and effectively decompose compounds that pollute the environment -- for example, certain petroleum products -- or decompose production waste from which useful substances can be obtained. The explanation of these problems opens up new opportunities in many economic sectors -- in the petroleum and gas industry (waste utilization), wood industry (lignin utilization), in microbiology, and nature conservancy.

The molecular genetics sector is conducting fundamental research, for example, on establishing the mechanism and regulation of the biosynthesis of proteins, that is, in the area that brings science closer to the artificial recreation of life. A number of projects are directed toward explaining the molecular organization of ribosomes -- very small cell particles that synthesize proteins -- and toward deciphering the structure of nucleic acids (which play a large role in the biosynthesis of protein in an organism). During the cycle of work in this field, Mart Saarma, the section chief, and Rikhard Villems, a senior scientific associate, received the 1980 Soviet Estonia Prize for Science and Technology.

The effective solution of many tasks is aided by cooperation with factories and applied institutes. For example, with the Tallinn Electrical Equipment Plant imeni Kh. Pegel'man, the "Punane PET" Plant, and others. An agreement has been concluded with the experimental plant of the Institute of Chemistry of the ESSR Academy of Sciences for producing pure preparations from snake venoms. With the Tallinn Chemical-Pharmaceutical Plant, there is an agreement for separating the components of adder venom to ascertain possibilities for producing medicines from them (in such a valuable raw material, it is important to utilize all its component parts).

Much useful is also provided by our international relations -- with Czechoslovakia, Bulgaria, and the GDR. Incidentally, colleagues from the GDR visit us and work with us, perhaps more often than we visit them because they are interested in our equipment and methodology for studying nuclear magnetic resonance, which today is more precise. And, as a whole, these contacts help more effective utilization of what is new in science and deeper solution of problems in the field of physical-chemical biology.

INCREASE IN BELORUSSIAN VUZ RESEARCH

Vilnius SOVETSKAYA LITVA in Russian 24 Dec 81 p 2

[Article: "Intensification of Research"]

[Text] In the higher schools of Belorussia, there are 15,000 scientific-teaching workers, and almost half of all the doctors and candidates of sciences are concentrated here. In the system of the BSSR Ministry of Higher and Secondary Specialized Education alone there are over 200 doctors of sciences, over 3500 candidates of sciences, and about 1600 students in formal graduate programs. This is a large force. Even more impressive are such components of scientific potential as supplies and equipment, organization, and information support. The cost of teaching and research equipment now exceeds 75 million rubles. Within the system of the BSSR Ministry of Higher and Secondary Specialized Education there are 2 scientific-research institutes, 3 special design-technological bureaus, 14 problem laboratories, and 40 scientific-research laboratories oriented toward economic sectors, 2 scientific-research sections, and 13 scientific-research sectors.

A natural question arises: What is the return from this potential and does it pay back the expenditures for its development? Let us compare the results of the last two five-year plans. The volume of scientific research increased by a factor of 1.8; the economic effect from introducing VUZ developments into the economy increased by a factor of 2.8; and the number of inventions grew by a factor of almost 4.

VUZ scientific activity in recent years has been characterized not only by quantitative, but also by profound qualitative progress. The return per ruble of expenditure in 1980 was 2.2 rubles.

At present, for example, VUZ's of the ministry are participating in the fulfillment of 28 special-purpose programs of the USSR State Committee for Science and Technology, 23 republic programs, and 34 programs of the BSSR Academy of Sciences. The proportion of most important subjects exceeds 58 percent.

The search for new ways to make use of VUZ scientific potential also requires improvement in the management of scientific research in the ministries that have VUZ's subordinate to them. Much was done in this area during the last five-year plan. At present, the BSSR Ministry of Higher and Secondary Specialized Education is continuing work on creating automated control systems, improving planning systems, organizing and introducing the results of research into production and, as a whole, raising the scientific potential of higher schools and making use of it more fully.

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BELORUSSIAN VUZ'S NEED MORE FUNDS TO MEET INTENSIFIED RESEARCH REQUIREMENTS

Minsk SOVETSKAYA BELORUSSIYA in Russian 12 Dec 81 p 2

[Article by B. Kaledin, chief of the Science Administration of the BSSR Ministry of Higher and Secondary Specialized Education and a candidate of engineering sciences: "The Intensification of Research"]

[Text] Over 15,000 scientific-teaching workers are employed in Belorussian higher schools, and almost half of all the doctors and candidates of sciences are concentrated in them. Just in the system of the BSSR Ministry of Higher and Secondary Specialized Education there are over 200 doctors of sciences and over 3,500 candidates of sciences, and about 1600 formal postgraduate students are studying. This is a large force. Even more impressive looking are such components of scientific potential as supplies and equipment, organizational support, and information support. The cost of teaching and scientific equipment now exceeds 75 million rubles. Within the system of the BSSR Ministry of Higher and Secondary Specialized Education there are now operating two scientific-research institutes, three special design-technological bureaus, 14 scientific-research problem laboratories and 40 laboratories that serve specific economic sectors, two scientific-research sections, and 13 scientific-research sectors. The cost of projects completed in 1980 reached 32 million rubles.

A natural question arises: What is the return from this potential, and are the expenses for its development repaid? Let us compare the results of the last two five-year plans. The volume of scientific research increased by a factor of 1.8; the economic effect from introducing VUZ developments into the economy grew by a factor of 2.8; and the number of inventions grew by a factor of 4. A large quantity of books, monographs, pamphlets, and articles was published and, for the first time in the history of Belorussian higher schools, a scientific discovery was made in the field of nuclear optics (by Professor V. G. Baryshevskiy of the Belorussian State University).

The scientific activities of VUZ's in recent years have been characterized not only by quantitative, but also by profound qualitative progress. The number of the most important subjects relative to the solution of large scientific and economic problems has grown and now constitutes over 55 percent of the work. There has been a substantial increase in the subjects supported by inventions. The return per ruble of expenditure in 1980 was 2.2 rubles. VUZ science relations were expanded and strengthened with production, with academy and economic-sector institutes, and with ministries and agencies.

Growth in the prestige of VUZ's is evidenced by the steadily increasing number of orders from industry for the conduct of scientific-research work, by high evaluations of the level of completed topics, by wide introduction of their results in series production, and by the conduct of international, all-union, and republic conferences, meetings, and seminars.

At the same time, the acceleration of scientific-technical progress brings VUZ's new, more complicated tasks. One of these is the necessity for more effective utilization of the scientific potential of higher schools and the rational distribution of resources. The problem is that the rates of growth in these resources, as well as in the number of scientific workers, is not unlimited and will decline. But the scientific output must steadily increase, since society needs the flow of new ideas, new knowledge, designs, technical solutions, technology, and so forth. Therefore, in the future, VUZ science will have to provide almost everything by mobilizing its internal reserves. In other words, it is a matter of intensifying scientific work.

Already, VUZ's have difficulty in satisfying industrial needs for many promising and important research projects because of limitations in the wage fund and the number of scientific workers. This is not just a matter of objective conditions, it seems, but it is also because planning bodies rarely take into consideration the specific capabilities of VUZ scientific potential. Attention is not given, for example, to the fact that many of our VUZ's, especially those in outlying areas, are young and are developing; they are now being actively included in scientific research and it is necessary for them to have the appropriate support. According to the amount of work being done per teacher and scientific worker (even the largest ones -- Belorussian Polytechnical Institute and Belorussian State University), because of an insufficient material base, lags far behind the VUZ's of Moscow, Leningrad, the Ukraine, and other union republics. We therefore think that BSSR Gosplan should take into consideration all of the special features of VUZ science and give it the necessary aid.

However, emphasis should be given to investigating other sources for strengthening the material base. One of these is the organization of laboratories oriented toward specific economic sectors, which allows not only the concentration of VUZ scientists' efforts on the solution of large scientific-technical problems, but also increases the wage fund and the number of workers at the expense of the respective ministries and agencies. Now, 40 such laboratories are operating within the system of the BSSR Ministry of Higher and Secondary Specialized Education, but we will actively create more of them in the future, including laboratories on the grounds of industrial enterprises. This will permit bringing science closer to production and more rapidly introducing VUZ innovations into practice.

There is also increasing significance in such forms for accelerating the utilization of scientific research results as the organization of special design-technological bureaus with experimental plants. In 1980, such a bureau was created at the Minsk Radio Engineering Institute. It is time to organize them at the Belorussian Technological Institute and at the Mogilev Machine-Building Institute. However, funds are necessary for their construction that can only be obtained on a shared basis from interested ministries. One would think that these ministries should be no less interested than the BSSR Ministry of Higher and Secondary Specialized Education in the solution of the problem. The experience of existing

special design-technological bureaus shows that they permit much acceleration in the implementation of innovations from VUZ science.

In the 11th Five-Year Plan, much attention is given to raising the qualitative level of scientific-teaching personnel, especially to the training of doctors of sciences. In the past year, 24 doctors' dissertations were defended (in 1979 there were 9). And still further optimization of the ratios between doctors and candidates of sciences, scientists possessing degrees and titles and the numbers of scientific-teaching workers, and between the number of assistant personnel and the total number of scientific workers remains one of the chief tasks of VUZ's. Now, these ratios are far from what are recommended and, as a result, scientists often fulfill work which is not really theirs. Meanwhile, the training of scientific personnel through formal postgraduate training programs and through individual competitive channels remains a very complicated problem. We still have too few formal graduate students who, by the end of study, will have defended a dissertation or will have submitted a dissertation for defense. Some work needs to be done here by VUZ's and the ministries. In particular, there should be an increase in requirements not only for individual degree seekers but also for their scientific instructors.

The success of scientific-research work to a large degree is guaranteed not only by the quantity of scientists, but also by the level of organization of their work. Unfortunately, it must be recognized that the coefficient of useful activity of many of our researchers, departments, divisions, and VUZ's as a whole is too low at times. Efficiency, mathematical planning and automation of experiments, the application of computer technology, and other possibilities for the intensification of work are being introduced very timidly into the practice of research.

Far from everything has been done for the effective utilization of scientific information. At times, much time is spent on searching for a needed book or article. Thorough work is still needed here on the part of libraries, scientific-technical information sections, and by all who are responsible for the timely provision of scientific-technical information to VUZ scientists.

Effectiveness in utilizing the scientific potential of higher schools depends in large measure on the quality of science management at all levels -- from VUZ departments to ministries. Much has been done in this field, especially in recent years, but there is still more to be done. First of all, this consists of larger-scale utilization of complex-special-purpose and scientific-technical programs in planning, an increased share of the most important topics, and the coordination of practically all research.

Now, for example, VUZ's in our ministry participate in the fulfillment of 28 programs of the USSR State Committee for Science and Technology, 23 republic programs, and 34 programs of the BSSR Academy of Sciences. The proportion of the most important topics has exceeded 58 percent. At the same time, there are VUZ's (Vitebsk Technological Institute for Light Industry and Grodno State University) that are weak in their participation in solving the most important scientific-technical problems. A number of teachers virtually do not participate in research. Thus, one of the potentials for increasing the effectiveness of scientific work is the maximum possible enlistment of all teachers in it, the strengthening of the

requirements for their activity, and improvement in the organization of socialist competition.

An extremely effective form for realizing VUZ scientific potential is the educational-scientific-production associations or complexes, which first originated in Belorussia. They unite the educational process, scientific research, and production into an integrated whole. Along with such veteran associations as "Belorussian Polytechnical Institute -- Minsk Tractor Plant" and "Belorussian Polytechnical Institute -- Minsk Automotive Plant," we have begun recently to operate new associations. Thus, the activities of the educational-scientific-production association "Belorussian Polytechnical Institute -- 'Azot'" has aided the rapid introduction of absorbers for drying gasses, the development of economical means for producing hydrogen from water, the increase in the share of meaningful diploma projects, and so forth. The economic effectiveness of research done within the framework of educational-scientific-production associations has exceeded the average indicator for the BSSR Ministry of Higher and Secondary Specialized Education.

The search for new ways to realize the scientific potential of higher schools requires improvement in the management of scientific research and in the ministries themselves that have VUZ's. Much was done in this field in the last five-year plan. Today, the BSSR Ministry of Higher and Secondary Specialized Education continues work on the creation of automated control systems, on improvement in the system for planning, organizing, and introducing research results into the economy and, as a whole, on increasing the scientific potential of higher schools and its fuller realization.

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BOOK REVIEW: EAST-WEST TECHNICAL INFORMATION EXCHANGE

Moscow MIROVAYA EKONOMIKA I MEZHDUNARODNYYE OTNOSHENIYA in Russian No 10, Oct 81
pp 153-154

[Review by Yu. Sergeyev of book "Vostok-Zapad: Ekonomicheskoye sotrudnichestvo. Tekhnologicheskoy obmen" (East-West: Economic Cooperation. Technology Exchange) by V. A. Mal'kevich, Moscow, Akademiya nauk SSSR, "Obshchestvennyye nauki i sovremennost'," 1981, 128 pages: "The Exchange of Technologies -- An Objective Necessity"]

[Text] In the general complex of world economic relations, international technology exchange is acquiring more and more significance. In it, a special place is occupied by relations in the field of science and technology between countries of the socialist community and capitalist states. This problem, which is extremely important in its theoretical aspect and exceptionally urgent in its practical aspect, is the subject of the work being reviewed (published also in English, Spanish, German and French)

V. Mal'kevich examines, with methodological correctness, the technological exchange between East and West as an integral component of their economic relations. Therefore, the analysis of the special features of scientific-technical cooperation is done against the background of the development of foreign trade relations, production cooperation, and other economic spheres, and this helps to clearly define the specifics of the research subject.

The section of the work devoted to the development of international technological exchange under the conditions of the scientific-technical revolution has significant theoretical interest. The author convincingly shows that the further expansion and deepening of the international division of labor will inevitably lead to the development of scientific-technical cooperation because, under the conditions of the scientific-technical revolution, individual countries become more and more specialized in certain fields of science and technology. "The large scale and complexity of the problems facing science and technology at the present stage," writes the author, "are forcing various countries to unite their efforts to achieve resolved aims. In this connection, the development of international exchange of the results of scientific-technical developments is objectively necessary. The progress and character of the scientific-technical revolution constantly reemphasizes this necessity" (pages 17-18).

Noting the objective pattern of further expansion in international technological exchange, V. Mal'kevich analyzes the difference in approach to this process by countries of the socialist community and capitalist states. He lays out the principles of the USSR position and of other CEMA-member countries that are directed toward all possible expansion of scientific-technical cooperation among all countries, independent of their social-economic systems, on the basis of mutual advantage and equal rights, and difference in principle from the position of the United States and certain other capitalist countries that are trying to utilize exchange in the scientific and technical field as a weapon to pressure other states to achieve their foreign policy goals.

The author examines in detail the actions of the United States that are directed toward limiting technological exchange with the USSR and other socialist countries and, with specific examples, reveals their political and economic groundlessness. The book makes a completely justified conclusion that has great merit: the present U.S. policy on technology transfer to socialist countries represents nothing new in principle (p. 33).

Immediately after the end of the Second World War, Washington began to create a mechanism to control the transfer of advanced technology to socialist countries; U.S. allies were also enlisted in its operation. Organizationally, it was consolidated in the creation of the Coordinating Committee for Multilateral Export Control (COCOM). The United States of America, over the last decades, has often tried to use this body to develop a unified policy among Western countries on transfer of advanced technology to socialist states. In this connection, the author's analysis of conflict between the United States and its allies on this question deserves attention (pp. 50-53). The book introduces convincing examples of the interest of business circles in the FRG, France, Italy, and a number of other Western countries in the development and expansion of economic and scientific-technical relations with the USSR and other states of the socialist community.

A significant place in the work has been allotted to the problem of technology transfer to developing countries (pp. 37-44 and 58-63). It has detailed the consistent policy of CEMA-member countries on questions of establishing a new international economic order and on developing the International Code of Conduct for Technology Transfer. The socialist states, in numerous international forums, have supported the demands of developing countries trying to limit the tyranny of multinational corporations and to adjust commercial conditions for technology transfer to the needs of their economies, and to prevent the abuse of their rights by suppliers. Countries of the socialist community, the author stresses, favor the universal application of the Code to all countries.

In examining the policy of capitalist states in the transfer of technology to developing countries, V. Mal'kevich reveals its imperialistic essence and exposes the narrow mercenary motives of the multinational corporations that try to make profit out of the backwardness and dependence of the recipient countries. The book demonstrates how the multinationals consciously raise the price on technology being transferred, taking advantage of the lack of sufficient information about alternative sources and the serious difficulties they have in evaluating the true value of the technology, the exclusive rights to which are gained by Western monopolies.

Much attention in the monograph is allotted to current forms of international technological exchange (pp. 63-111), particularly to new forms of scientific-

technical cooperation between socialist and capitalist countries. Proceeding from the position that each form of technology transfer can include several types of foreign economic activity (this position is supported by examples from commercial practice), the author proposes what, in our view, is a successful classification of these forms, especially dwelling on such forms as licensing and compensation agreements, cooperation agreements, joint development projects, and certain others. There is an interesting section which examines the role of export-import operations in technological exchange between East and West.

While highly valuing the work being reviewed, I would like to add some critical comments. Thus, in the analysis of certain forms of technological exchange, there is an overburdening with factual material that is often unjustified from the point of view of the author's argument. The book would benefit from illustrative materials such as graphs, diagrams, and so forth. Further, considering that the United States occupies a leading place in the capitalist world both in the volume and in the variety of forms for technology transfer, it would be desirable, based on the aims of the research conducted, to provide a comparative analysis of technology transfer by American companies and Soviet organizations. It should also be noted that the author of the monograph uses the term "export of services." In our view, this term, while appropriate in a journalistic article, is hardly fitting in serious research. Services in the form of insurance, management experience, and so forth are not exported, but extended. Individual redundancies and stylistic errors were not avoided successfully.

As a whole, V. Mal'kevich's monograph represents original and interesting research which, we hope, will interest Soviet and foreign readers.

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BRIEFS

GEORGIAN RATIONALIZERS REPORT--A plenum of the Georgian Republic Council of the All-Union Society of Inventors and Rationalizers discussed the question of strengthening the work of the society's organizations in enlisting the republic's inventors and rationalizers in the movement for economy and rational utilization of material and fuel-energy resources. I. Chumburidze, secretary of the republic council of the society, presented a report. An organizational question was also examined. In connection with a transfer to other work, the plenum released A. Lomidze from his duties as chairman of the republic council of the All-Union Society and removed him from the presidium. V. Zhidko was elected chairman of the Georgian council and a member of the presidium. The secretary of the Georgian Council of Trade Unions, I. Khazaradze, participated in the work of the plenum. [Text] [Tbilisi ZARYA VOSTOKA in Russian 30 Dec 81 p 3] 9645

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